STATE OF IDAHO'S COMMENTS

DRAFT BIOLOGICAL OPINION ON OPERATION OF THE
FEDERAL COLUMBIA RIVER POWER SYSTEM
INCLUDING THE JUVENILE FISH TRANSPORTATION PROGRAM
AND THE BUREAU OF RECLAMATION'S 31 PROJECTS,
INCLUDING THE ENTIRE COLUMBIA BASIN PROJECT
(DATED JULY 27, 2000)

PART I

COMMENTS REGARDING
BUREAU OF RECLAMATION OPERATIONS,
FCRPS RESERVOIR OPERATIONS, AND
DECISION CRITERIA

PART II

COMMENTS REGARDING JEOPARDY ANALYSIS AND
BIOLOGICAL REQUIREMENTS OF
LISTED SPECIES

Submitted September 29, 2000

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INTRODUCTION

The State of Idaho's comments on the Draft Biological Opinion ("BiOp") are divided into two parts.

Part I of these comments focuses primarily on flow augmentation issues associated with the operation of United States Bureau of Reclamation ("Bureau") reservoirs in the Snake River Basin. These comments address the following topics: (1) the definition of the action subject to consultation; (2) the assessment of the impacts of Bureau operations in the upper Snake River Basin;[1] (3) criteria for inclusion of measures within the reasonable and prudent alternative ("RPA"); (4) the meaning of flow objectives stated in the BiOp; (5) the effectiveness of upper Snake River flow augmentation as a tool for salmon recovery; and (6) specific flow augmentation measures contained in the RPA.

Part II of these comments focuses primarily on scientific issues. These comments address the following topics: (1) the need for collaboration between National Marine Fisheries Service ("NMFS") and other fishery managers; (2) assessment of risk to the listed species; and (3) scientific approach to assessing jeopardy and conservation actions.

The State of Idaho also intends to submit comments addressing two additional subject areas at a later time. Part III of our comments will address juvenile and adult passage issues at the mainstem projects on the lower Snake and Columbia rivers. Part IV of our comments will address off-site mitigation measures set forth in the BiOp in greater detail. Because of the short comment period on a complex document, the State may also supplement these comments with updated analyses and the results of further consultations with NMFS.

[1] As used in these comments, the term "upper Snake River Basin" refers to the watershed upstream of Hells Canyon.

SUMMARY OF COMMENTS

PART I: BUREAU OF RECLAMATION OPERATIONS, FCRPS RESERVOIR OPERATIONS AND DECISION CRITERIA

I. Definition of the Action Subject to Consultation

The BiOp correctly defines the operation and maintenance of Bureau projects as an action separate from the operation of the Federal Columbia River Power System ("FCRPS"). The FCRPS has been defined in past biological opinions and environmental impact statements to include the 14 federal dams in the Columbia Basin that have major influences on the multiple purposes for which power production is coordinated under the Pacific Northwest Coordination Agreement. In contrast, only a small portion of the Bureau projects in the Snake River Basin are associated with federally-owned hydropower facilities and are operated primarily to provide water for irrigation. The operation of Bureau projects in the upper Snake River Basin is not interdependent or interrelated with the FCRPS or with Bureau projects elsewhere in the basin. Moreover, NMFS has developed flow augmentation measures that are specific to the upper Snake River projects.

The fact that the Bureau's operations are a separate action from FCRPS operations has important implications for the BiOp. Most notably, NMFS has an obligation under the Endangered Species Act ("ESA") to determine the effects of the "action" under consultation – in this case the operation of the Bureau's irrigation projects – on the listed species and to determine whether the action causes jeopardy to the listed species. The State of Idaho respectfully suggests that because of these factors, the upper Snake River Bureau projects should be addressed in a separate BiOp.

II. Scope of the Measures Considered in the BiOp

The State of Idaho agrees that the measures contained in the BiOp must be viewed as part of a larger salmon recovery program spanning all of the Hs (habitat, harvest, hatcheries, and hydropower). We also agree that the core biological standard should be whether the actions contained in the BiOp, together with actions taken in other sectors, meet the biological requirements of listed evolutionarily significant units ("ESUs"). We are concerned, however, that off-site mitigation will tend to shift the burden of conservation from the hydropower system to the other sectors. In addition, some of the survival benefits attributed to off-site mitigation, particularly in the habitat sector, are not scientifically supported. And, the BiOp's current approach to off-site mitigation calls for an overly-prescriptive approach to habitat issues and an unwarranted intrusion by the action agencies, particularly the Bonneville Power Administration ("BPA"), into non-hydropower arenas.

III. Assessment of the Impacts of Bureau Operations in the Upper Snake River

The BiOp's assessment of the impacts of Bureau operations on lower Snake River contains factual errors, applies flawed logic, and presents an inaccurate picture of the flow impacts of Bureau operations. The key conceptual problem with the BiOp's assessment is that it focuses on the time that reservoir storage is released during the irrigation season and the consumptive use by crops. This approach overlooks the fact that Bureau storage operations decrease natural flows at the time water is stored rather than at the time stored water is released for irrigation. This fact is significant because a substantial portion of the storage in Bureau reservoirs occurs in the winter time and hence does not affect flows during the salmon migrations. The BiOp's analysis is also flawed because it inappropriately counts the failure to wholly dedicate Bureau reservoirs to flow augmentation as an "effect of the action."

An examination of actual Bureau storage operations reveals that virtually no storage occurred in the months of July and August during the period 1928-98. This means that Bureau storage operations had little impact on flows during the fall chinook juvenile migration. Moreover, any reduction in flows is offset by the approximately 400 kaf of return flow from Bureau-based irrigation that re-enters the Snake River annually during the salmon migration periods. Therefore, Bureau operations actually have the effect of increasing flows during the fall chinook migration period.

Bureau-based storage operations have no significant effect on the achievement of NMFS' flow objectives during the spring migration period. In dry years, most of the storage in Bureau reservoirs occurs during the winter. In nearly all years when spring flow objectives were not met for the period 1928-98, Bureau reservoirs stored a relatively small volume of water after April 1. Thus, the BiOp's statement that Bureau operations are a "major impediment" to the achievement of flow objectives is not correct.

Other information indicates that Bureau operations are not responsible for the decline of the listed salmon and steelhead populations. There has been no dramatic downward trend in Snake River flows at Lewiston since 1916, which is prior to the date of construction of most of the Bureau reservoirs in the upper Snake River Basin. The trend in flows during that period shows only a slight reduction during the spring migration period and a slight increase during the summer migration period. Moreover, any impact from Bureau operations is insignificant relative to the effects of the mainstem FCRPS projects on river velocity and other hydrologic characteristics of the lower Snake and Columbia rivers.

Based on this information, NMFS' conclusion that the Bureau's operations in the upper Snake River jeopardize listed species is erroneous. NMFS has consistently found that other actions with much greater impacts do not pose jeopardy to Snake River salmon and steelhead.

III. Discussion of Factors Considered in the RPA

The State of Idaho recommends that the BiOp include a more complete discussion of the considerations NMFS took into account in developing the RPA. In particular, NMFS should better explain its consideration of feasibility and trade-offs among alternative courses of action. The RPA should be based on a combination of measures that achieves the desired results with a reasonable degree of certainty and with the fewest adverse economic and environmental consequences.

IV. Role of Flow Objectives

The BiOp does not offer a consistent description of the role of flow objectives in hydrosystem management. NMFS acknowledges, as it must, that the flow objectives are not reliably achievable in dry years due to natural variations in run-off. Therefore, BiOp should clearly state that the flow objectives are either an RPA measure the action agencies must implement nor a specific performance standard. Instead, flow objectives should serve as a guide to manage available water resources during the juvenile salmon migration and to guide the flood control operations of the U.S. Army Corps of Engineers ("Corps").

V. Snake River Flow Augmentation

Flow augmentation from the upper Snake River is not an effective tool for salmon recovery because it is capable of producing only small changes in river velocity in the migration corridor, with correspondingly small benefits to migrating salmon and steelhead. Moreover, limitations with the existing NMFS PIT-tag studies of subyearling fall chinook survival mean these studies cannot be used to inform decisions regarding the use of Snake River flow augmentation. Finally, additional upper Snake River flow augmentation would cause severe economic, ecological, and recreational impacts on the region.

VI. Measures Included in the RPA

The State of Idaho objects to the upper Snake River flow augmentation measures contained in the RPA on the basis that they are not appropriately linked to the Bureau's actual impacts and, further, are outside the discretion of the Bureau to implement without the consent of reservoir spaceholders. The State's comments are directed at the propriety of requiring flow augmentation from the Bureau's upper Snake River Basin projects under the ESA. The State remains committed to good faith negotiations of water rights issues with stakeholders as part of the Snake River Basin Adjudication. These negotiations provide the most effective means for addressing the federal agencies' flow augmentation objectives because all stakeholders are involved.

NMFS should not apply the "zero net impact" standard to contract modifications involving water spreading because the acreage in question has been irrigated for decades and is thus part of the environmental baseline. Moreover, much of this acreage is subject to water spreading only because of outdated and incorrect land classifications by the Bureau.

Albeni Falls should be operated to maintain a winter pool level of 2055' msl to protect spawning habitat for kokanee. Kokanee are an important part of the prey base for threatened bull trout.

The Corps should give a high priority to re-evaluating existing flood control operations at FCRPS projects.

The State agrees that measures to improve the spawning and rearing habitat of listed species need to move forward. However, we are concerned that the specific approach contained in the RPA is unduly prescriptive and intrusive. We have special concerns regarding the creation of a federal water brokerage and encourage NMFS to use existing state law mechanisms to achieve the same conservation purposes.

PART II: JEOPARDY ANALYSIS AND BIOLOGICAL REQUIREMENTS OF LISTED SPECIES

Part II of these comments address the scientific underpinnings of the BiOp and Recovery Strategy in the context of Snake River issues. Our intent in this section is not to advocate specific management actions, but to help ensure the best possible science provides the analytical basis of the BiOp and Recovery Strategy. The selection of recovery actions is a policy decision made in the context of biological and non-biological considerations. The role of these comments is to help strengthen the scientific foundation from which various management alternatives are considered, and to assess these alternatives from a biological and scientific basis.

Several key deficiencies have been identified in the analyses used for the BiOp and Recovery Strategy. First, the characterizations of extinction risk, stock productivity, jeopardy standard and conservation opportunities are based on optimistic assumptions and generally ignore more conservative assumptions. Second, the conservation burden of the hydrosystem is discounted based on optimistic assumptions that ignore the weight of evidence regarding delayed and "extra" mortality attributable to the hydrosystem. Third, the conservation burden discounted from the hydrosystem is shifted to other sectors without clear justification or analysis of the weight of evidence to support this shift. Fourth, specific RPA measures, and the biological feasibility of these measures to avoid jeopardy, are not identified. Fifth, the performance standards and measures are inadequate to assess the effectiveness of RPA measures. Sixth, a contingency RPA is not identified or evaluated in case environmental conditions deteriorate or performance standards are not met.

In general, the BiOp and Recovery Strategy select the most optimistic (i.e., least conservative) assumptions regarding extinction risk, lack of hydrosystem impacts, and the benefits of improving habitat and hatcheries. NMFS selected non-conservative assumptions for factors affecting the amount of survival improvements needed to avoid jeopardy. NMFS selected the optimistic assumption that small, threatened populations face no threat of an extinction vortex, in spite of theoretical and empirical evidence to the contrary. NMFS also selected optimistic assumptions for the extinction and survival standard, recovery standard, FCRPS hydrosystem performance standard, definition of high risk, hatchery effectiveness, years for time series, and effect of fish density on population growth rates.

NMFS also typically selected optimistic assumptions for factors affecting the amount of survival improvements attributed to existing and proposed measures in the BiOp. For example, NMFS selected the most optimistic assumptions to attribute estimated survival improvements of juvenile migrants since the 1995 Biological Opinion on FCRPS Operations to improvements made to the hydrosystem, rather than balance this assumption with the possibility that model differences or high natural flow and spill from good water years could also account for these increases. NMFS assumed there is no delayed mortality associated with juveniles migrating inriver through the FCRPS, in spite of a wealth of information to the contrary and no NMFS data or analyses confirming their assumption.

The effect of NMFS accentuating non-conservative assumptions, regardless of scientific information questioning these assumptions, results in several fundamental errors in the BiOp and Recovery Strategy: 1) underestimation of the actual extinction risk and overestimation of the probability of survival and recovery; 2) underestimation of the survival improvements necessary to avoid jeopardy and ensure survival and recovery of listed Snake River salmon and steelhead; and 3) overestimation of the ability of BiOp measures to provide necessary survival improvements.

There are several important scientific steps that must be taken to determine biologically defensible recovery strategies:

Step 1: Determine extinction risk and survival and recovery standards for jeopardy;

Step 2: Determine the amount of survival improvements needed to avoid extinction and meet survival and recovery standards;

Step 3: Determine fish mortality and allocate among life stages;

Step 4: Determine the amount of discretionary[2] mortality above the natural baseline;

Step 5: Assess management opportunities to address this discretionary mortality;

Step 6: Select a suite of management actions that are likely to provide the necessary survival improvements; and

Step 7: Develop an aggressive monitoring and evaluation plan to assess effectiveness within the context of environmental variability.

The BiOp and Recovery Strategy have errors and omissions in each of these steps that influence conclusions. Scientific collaboration with the states and tribes will be necessary to correct these errors and omissions for the final BiOp and Recovery Strategy. Objective risk assessment in the final BiOp and Recovery Strategy will demonstrate:

- Snake River ESUs are imperiled, particularly at the population level; providing recovery requires a substantial improvement (e.g., three-fold change for Snake River spring/summer chinook) in overall life cycle survival;

- The most risk-averse actions, for all species and runs (recognizing the full range of scientific debate and uncertainty) must address direct and delayed effects of the

[2] Discretionary mortality is the mortality beyond the natural baseline that can potentially be managed. Most discretionary mortality is anthropogenic, although some factors, such as avian and pinniped predation, are also partially linked to natural ecosystem processes.

FCRPS, coupled with immediate actions regarding harvest, predation, early ocean and estuary survival and degraded tributary habitat; and

- Resolution of uncertainty adequate to change these conclusions is unlikely to be gained through an additional five or ten years of research.

Given the current lack of acceptance of the natural river option, it is important to implement an aggressive suite of alternative management actions across the lifecycle of the fish, but focused on the mainstem FCRPS. NMFS should consider the Governors' Recommendations,[3] which do a better job of keeping the primary sources of discretionary mortality in focus and embracing a conceptual approach to attempt to address these problems prior to breaching dams. Through their annual migration plans and involvement in the Regional Forum, NPPC program, and Governors Recommendations, the State of Idaho has identified several actions that would more aggressively address significant sources of direct and delayed discretionary mortality than the existing Reasonable and Prudent Alternatives (RPA) identified in the BiOp. The State of Idaho will provide specific recommendations for enhancing the RPA during subsequent comments and consultation with NMFS and the Federal Caucus.

[3] *Recommendations of the Governors of Idaho, Montana, Oregon and Washington for the Protection and Restoration of Fish in the Columbia River Basin*. July, 2000.

PART I: COMMENTS REGARDING BUREAU OPERATIONS, FCRPS OPERATIONS AND DECISION CRITERIA

I. Chapter 1: Objectives

A. The BiOp Correctly Defines Operation And Maintenance Of Bureau Projects As An Action Separate From The Operation Of The FCRPS.

The BiOp sets forth three actions that are subject to the consultation: (1) continued operation and maintenance of the FCRPS; (2) continued operation and maintenance of 31 projects managed by the Bureau; and (3) continued operation of the juvenile fish transportation program. BiOp at 1-1.

We agree that the operation of the Bureau projects is a separate action from operation of the FCRPS.[4] The FCRPS has been defined in the past to include major projects that are operated primarily for hydropower production. In contrast to the FCRPS projects, the 22 storage facilities and several smaller reservoirs and diversion works operated and maintained by the Bureau in the Snake River Basin were authorized for the primary objective of supplying irrigation water. In the Snake River Basin, only 24 percent of the reservoir storage capacity managed by the Bureau is associated with a project that has a federally-owned powerhouse.[5]

The federal agencies have historically treated the Bureau irrigation projects as separate from the FCRPS. The two Bureau projects that are part of the FCRPS, Grand Coulee and Hungry Horse, are currently operated under the February 7, 1997, Bureau Record of Decision ("ROD") that followed the System Operation Review Final Environmental Impact Statement ("SOR"). The ROD states:

> The specific scope of the SOR encompasses 14 Federal dams on the Columbia and lower Snake Rivers that have major influenced [sic] on the multiple-purpose system operation and for which power production is coordinated under the PNCA [Pacific Northwest Coordination Agreement]. These include five storage dams: Hungry Horse and Grand Coulee (Reclamation) and Libby, Albeni Falls, and Dworshak (Corps); and nine downstream run-of-river projects: Chief Joseph, Lower Granite, Little Goose, Lower Monumental, Ice Harbor, McNary, John Day, The Dalles, and Bonneville (all Corps).

ROD at 4.

Likewise, the March 1995 Biological Opinion on hydropower operations did not include the Bureau's upper Snake River projects within the scope of the "action" that was subject to the consultation. The 1995 BiOp states: "The action considered by this biological opinion is described in Section II.A.-II.G of the biological opinion regarding 1994-1998 Operation of the

[4] As used in these comments, "Bureau projects" refers to projects operated primarily for irrigation and does not include Grand Coulee and Hungry Horse dams, which are operated by the Bureau as part of the FCRPS.

[5] Projects with no federal hydropower have 5,446,005 acre feet of storage, or 76 percent of the total. Projects with federal hydropower facilities have 1,718,400 acre feet of storage, or 24 percent of the total.

FCRPS and Juvenile Salmon Transportation Program in 1994-1998 (Mar. 16, 1994). . . ." Although the referenced sections of the 1994-1998 Biological Opinion do not describe the specific projects subject to consultation, Section I.A. of the 1994-1998 BiOp provides:

> The FCRPS encompasses those dams and reservoirs owned and operated as a coordinated system for the purpose of power production by the three action agencies on behalf of the Federal Government. For purpose of this consultation, these are Dworshak, Lower Granite, Little Goose, Lower Monumental, and Ice Harbor in the Snake River Basin; Hungry Horse, Libby and Grand Coulee in the upper Columbia River basin [sic]; and McNary, John Day, The Dalles, and Bonneville in the lower Columbia River.

1994-1998 BiOp at 1.

B. The Bureau's Upper Snake River Operations Should Be Treated As A Separate Action From Its Operations Elsewhere In The Columbia River Basin.

While the BiOp correctly defines the operation of the Bureau's system of irrigation reservoirs and the FCRPS as separate actions, it fails to distinguish between the Bureau's operations in the upper Snake River Basin and its operations elsewhere. The Bureau's upper Snake River operations should be addressed separately because they are not interrelated or interdependent with the Bureau's Columbia Basin Project or other projects. Moreover, NMFS has developed flow augmentation measures that are specific to the upper Snake River projects.

This approach is consistent with NMFS' approach in its earlier biological opinions. NMFS and the Bureau recently concluded a consultation that treated the Bureau's operation of its upper Snake River reservoirs as an action separate from the operation of the FCRPS and from Bureau projects in other parts of the Columbia Basin. *See* 1999 BiOp.

C. The BiOp Must Assess The Actual Impacts Of Bureau Operations And Determine Whether These Operations Independently Jeopardize Listed Species.

The fact that Bureau operations are a separate action from FCRPS operations has important implications for the BiOp. Most notably, NMFS has an obligation under the ESA to determine the effects of the "action" under consultation – in this case the operation of the Bureau's irrigation projects – on the listed species and to determine whether the action causes jeopardy to the listed species.

Regulations implementing the ESA define NMFS' responsibilities during formal consultation to include:

> Evaluate the effects of the action and the cumulative effects on the listed species or critical habitat.

> Formulate its biological opinion as to whether the action, taken together with cumulative effects, is likely to jeopardize the continued existence of the listed species or result in the destruction or adverse modification of critical habitat.

50 C.F.R. § 402.14(g)(3) & (4).[6]

Although the BiOp states that FCRPS and Bureau operations are separate "actions" under consultation, it combines both actions into a single biological opinion and states that it "does not attempt to apportion the relative contribution of the FCRPS and BOR projects to the current status of the ESUs." BiOp at 1-1. Moreover, NMFS did not attempt to determine whether the impacts of Bureau operations in the upper Snake River – independent of the impacts of the FCRPS – cause jeopardy to the listed species. Thus, NMFS has failed to examine the separate impacts of Bureau operations in the Snake River in any meaningful manner as required by the ESA.

The fact that NMFS has not attempted to make separate assessments regarding Bureau or FCRPS impacts on listed species does not mean that such an analysis is not scientifically feasible. In fact, as explained in an analysis of the impacts of the Bureau projects contained in our comments on Chapter 6 of the BiOp, below, determining the impact of Bureau operations on Snake River flows is straightforward. Our comments on Chapter 6 discuss the flow impacts of Bureau's upper Snake River operations in detail and demonstrate three major points:

(1) Bureau operations have no impact on lower Snake River flows during the Snake River fall chinook migration period and, in fact, contribute return flows that increase streamflow during that period;

(2) In dry years, storage operations during the spring/summer chinook and steelhead migration period are not significant and rarely causes a failure to meet NMFS' flow objectives during that period; and

(3) Impacts of the operations on river conditions in the lower Snake River are miniscule compared to those of the mainstem FCRPS projects.

When compared to the impacts of other actions for which NMFS has found "no jeopardy," it is clear that Bureau operations in the upper Snake River do not jeopardize listed salmon and steelhead populations.[7] NMFS' failure to meaningfully evaluate Bureau impacts and determine whether they jeopardize listed species is contrary to its ESA obligations. We respectfully request that NMFS evaluate the information in our comments on Chapter 6 and

[6] FRCPS operations are not a cumulative effect in this context. Cumulative effects are defined as "those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation." 50 C.F.R. § 402.02.

[7] Two recent NMFS biological opinions on harvest illustrate the magnitude of incidental take that NMFS is willing to accept as not posing jeopardy to listed species. The biological opinion on 2000 fall season fisheries found that a 31.29 percent impact on upriver bright fall chinook would not jeopardize Snake River fall chinook. The biological opinion on 2000 winter, spring and summer fisheries permitted a 9 percent harvest impact on Snake River spring chinook.

make a specific determination regarding whether the Bureau's upper Snake River operations pose jeopardy to listed species.

D. The BiOp Correctly Adopts An "All-H" Approach To Mitigation; However, This Approach Must Be Refined To Ensure The Burden Of Conservation Is Not Shifted From The Hydropower System To Other Sectors.

The BiOp states at page 1-7: "NMFS looks beyond the particular action area to consider measures likely to be necessary in all life stages that, in combination, would insure that the biological requirements for listed species are met and thereby insure its continued existence." We agree that the measures contained in the BiOp must be viewed as part of a larger salmon recovery program spanning all of the Hs (habitat, harvest, hatcheries, and hydropower). We also agree that the core biological standard should be whether the actions contained in the BiOp – together with actions taken in other sectors – meet the biological requirements of listed ESUs. The important point here is that the impacts of federal actions addressed in the BiOp do not exist in isolation from the impacts of other federal and private activities. The current status of Columbia Basin anadromous fish populations is not the result of any single problem and their recovery will not be achieved through any single solution. Solutions must, however, specifically address those factors that are primarily limiting the survival and recovery of each ESU. These factors may be common to all ESUs, or may be unique to specific ESUs.

There are two advantages to the broad scope of measures considered in the BiOp. First, the broad scope gives NMFS greater flexibility to put together a program that combines the most cost-effective and reasonable measures in all sectors in order to meet the biological requirements of listed salmon and steelhead populations. It makes little sense to pursue a dramatically expensive and biologically ineffective strategy in the hydropower sector while ignoring less expensive and more effective strategies elsewhere. Second, the BiOp's statement that measures in all life stages must "insure that the biological requirements for listed species are met" enhances the accountability of the fish recovery effort. In the past, NMFS has too often been willing to make a "no jeopardy" finding based on incremental reductions in mortality for a particular activity without examining whether these mortality reductions are sufficient to meet the biological requirements of the listed species across all life stages. For instance, NMFS' 2000 BiOp on fall season fisheries concluded that a 30 percent reduction in the harvest of Snake River fall chinook relative to the base period of 1988 to 1993 is sufficient to avoid jeopardy. But, NMFS never examined whether the resulting harvest rate, which can approach 50 percent in all ocean and in-river fisheries, is consistent with the survival and recovery of Snake River fall chinook given mortality rates in other sectors. The jeopardy analysis used in this BiOp holds the hydropower sector to an appropriate bottom line standard: whether the measures are sufficient to meet the overall biological needs of the listed species. All other sectors should be held to the same standard.

Although we support the concept of an All-H approach to salmon recovery, several important issues with the BiOp's current approach to off-site mitigation must be resolved. Three concerns are worthy of brief mention. First, the State of Idaho is concerned that off-site mitigation will tend to shift the burden of conservation from the hydropower system to the other sectors. This concern is particularly significant with respect to the use of off-site mitigation to meet the "full mitigation standard" for avoiding jeopardy. Second, some of the survival benefits attributed to off-site mitigation, particularly in the habitat sector, are not scientifically supported. Only a handful of the Snake River spring/summer chinook index stocks inhabit spawning and rearing habitat that is significantly degraded and hence has any potential for improvement. Third, the BiOp's current approach to off-site mitigation calls for an overly prescriptive approach to habitat issues and an unwarranted intrusion by the action agencies, particularly the BPA, into non-hydropower arenas. This last point has an important corollary regarding the scope of the action agencies' legal authority. NMFS may appropriately weigh its expectation that certain habitat measures will enhance salmon survival in determining whether the listed species in jeopardy. However, the BiOp cannot extend the authority or jurisdiction of the action agencies to require others, through enforcement efforts or otherwise, to undertake measures in areas which are unrelated to the FCRPS or over which NMFS has no jurisdiction or authority.

II. Chapter 6: Effects Of The Action

A. The BiOp's Assessment Of The Impacts Of Bureau Operations In The Snake River Is Deeply Flawed.

Section 6.2.5.2.3 discusses the flow depletion effects of Bureau-based irrigation and concludes that: "Flow depletions caused by BOR-based irrigation are a major impediment to meeting NMFS's flow objectives." BiOp at 6-28. This assertion is based on two analyses: (1) the estimated monthly average water consumption of crops at Bureau irrigation projects upstream of McNary Dam (Table 6.2-1); and (2) the percent of years that simulated mean monthly flows at certain other dams are not met as a result of Bureau-based irrigation (Table 6.2-2). These analyses contain factual errors, apply fundamentally flawed logic in defining the effects of the action, and present a grossly misleading picture of the flow impacts of Bureau operations.

As noted above, regulations implementing the ESA require NMFS to examine the effects of the action under consultation. 50 C.F.R. § 402.14(g)(3). NMFS correctly states the issue at the outset of its analysis: "This Biological Opinion focuses on the effects of BOR's projects on streamflow in the mainstem of the Snake and Columbia rivers and the role these hydrologic effects play in salmon survival." This inquiry necessarily focuses on the effects of Bureau projects on streamflows during the spring migration period (April 3-June 20) and the summer migration period (June 21-August 31). Unfortunately, after having correctly defined the issue, NMFS' analysis goes badly awry.

1. The BiOp Mistakenly Focuses On Water Diversion And Consumptive Use – As Opposed To Reservoir Storage Operations – In Assessing The Impact Of Bureau Projects.

The BiOp first analyzes Bureau impacts in terms of the total streamflow depletion effects of Bureau irrigation projects upstream of McNary Dam. The BiOp notes that about half of the total streamflow depletion in the basin occurs at Bureau projects and that "[a]ll but about 925 kaf of this 6.5 Maf depletion occurs at a time when available storage is being managed to achieve the flow objectives (April through August)." BiOp at 6-28. This statement reflects a basic conceptual problem in NMFS' approach to assessing the impacts of Bureau operations.

NMFS' mischaracterization of the projects stems from a misunderstanding of how Bureau reservoirs store water for irrigation. The basic purpose of irrigation storage is to capture a portion of the water that would otherwise go downstream during the winter and high run-off periods in the spring. The stored water is then released from the reservoirs at times when it can be used to irrigate crops. Thus, Bureau reservoirs begin their annual storage operation soon after the irrigation season ends in the fall. The reservoirs store water throughout the winter, subject to the need to release water to provide space for flood control. As natural flows begin to decline in the summer following the melting of the mountain snowpack, the Bureau releases the water stored in its reservoirs. This water is then applied to the land. A substantial portion – roughly half – of the stored water that is released for irrigation finds its way back the river as return flow.[8]

The conceptual flaw in NMFS' approach to assessing Bureau impacts is that it focuses on the time that reservoir storage is released during the irrigation season and the consumptive use by the crops irrigated by this water. Because irrigation occurs primarily during the salmon migration season, NMFS assumes that Bureau projects have a substantial effect on flows during the migration season. This approach overlooks a simple but absolutely crucial fact: most of the water released from Bureau reservoir storage space for irrigation purposes was stored earlier in the year. Without its earlier storage in a Bureau reservoir, the water would have flowed downstream and would not have been in the river at the time that it is delivered for irrigation. Thus, water stored during the winter and released for irrigation in the summer does not reduce natural flows during the salmon migrations. This point is pivotal and merits restating: *Bureau projects decrease river flows only at the time water is stored. The subsequent release, diversion, withdrawal, and consumptive use of water previously stored in Bureau reservoirs does not decrease natural flow by a single acre-foot during the period of water release and use.*[9]

This point demonstrates why Table 6.2-1, the estimated monthly average crop consumption at Bureau irrigation projects, is not useful for estimating actual Bureau impacts. The table does not allow us to discern what portion of the depletion involved water that was stored in Bureau reservoirs during the spring and summer (which reduces flows during the salmon migration period) and what portion involved water stored during the winter (which has no effect on flows for salmon).[10]

In sum, to calculate the effect of Bureau reservoirs, one must look to the timing of reservoir storage and to the volume of return flow during the salmon migration periods.

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[8] Interestingly, irrigation reservoirs operate under a nearly opposite pattern from the FCRPS hydropower reservoirs. The FCRPS reservoirs store water during the spring and summer for release during the winter, when regional demand for electricity is highest.

[9] This does not mean that the location and timing of irrigation is entirely irrelevant to the analysis. A substantial portion of the stored water that is applied to the land comes back to the river as return flow.

[10] Reducing flows during the spring is an impact only if one assumes that there is a flow-survival relationship for spring migrants, a subject on which NMFS has been ambivalent.

2. NMFS' Use Of The "Without BOR Depletion" Scenario To Calculate Bureau Impacts Is Misleading.

Table 6.2-2 in the BiOp includes the key information NMFS relies upon to assess the impacts of Bureau operations. The table purports to show the percent of years that operation of the Bureau projects would cause a failure to meet flow objectives at Lower Granite and other dams based on a fifty-year period of record (1929-1978). To calculate Bureau impacts, the table compares flows under current Bureau operations with flows under a simulated "without BOR depletion" scenario.

Robert J. Sutter, P.E., Technical Hydrologist and Hydrology Section Manager at the Idaho Department of Water Resources, has prepared a review of Table 6.2-2. His report is attached hereto as Exhibit 1 and incorporated herein by this reference. Two flaws in the table are readily apparent. First, the table overstates the amount of depletion caused by Bureau-based irrigation by approximately 50 percent. NMFS failed to distinguish between full service lands, which use Bureau storage as a primary water supply, and supplemental lands, which rely on Bureau storage as a secondary source. The difference in water use patterns between the two types of lands can be substantial. For instance, full service lands in the Boise River Basin used 2.18 acre-feet of storage per acre, while supplemental lands used 0.66 acre-feet of storage water per acre. NMFS simply assumed that all lands used Bureau storage as their sole source of water.

Second, Table 6.2-2 suffers from the same problem as Table 6.2-1: it examines Bureau impacts in terms of agricultural depletions rather than actual reservoir storage. The table calculates the total depletion due to all agriculture, assigns a fraction of that total depletion to Bureau-based irrigation, and assumes that the Bureau-based depletion occurs primarily during the salmon migration season. As explained in the previous section, this overlooks the fact that the storage water used for irrigation was actually stored at a different time than when it is used. The table overlooks the distinction between diversions of reservoir storage, which deplete flows when the storage occurs, and diversions pursuant to natural flow water rights, which deplete flows at the time the diversion occurs.

The third problem with Table 6.2-2 requires more detailed discussion because it reveals a basic misconception in NMFS' analysis of Bureau impacts. In developing the "without BOR depletions" scenario, NMFS eliminated all irrigation storage, diversions, and return flows. This "pre-development" scenario stretches the available data and analytical tools beyond their reliable use and puts the entire analysis well into the realm of speculation.[11] But, then NMFS took the analysis one stunning step further: it assumed that the Bureau reservoirs would remain in place

[11] The "without BOR diversions" scenario used in Table 6.2-2 is based upon a June 1999 Bureau study, prepared under direction from NMFS, entitled *Cumulative Effects of Water Use: An Estimate of the Hydrologic Impacts of Water Resource Development in the Columbia River Basin*. The results of the study must be treated with caution. In a letter to the Bureau regarding the basis for this analysis, attached as Appendix A to the study, the directors of the water management agencies for the states of Washington, Oregon, Montana, and Idaho explained that they had serious reservations regarding the accuracy of the simulations of pre-development scenarios or cases. The directors stated: "While we understand that the USBR was specifically required by NMFS to include these cases, our review concluded that the studies have little usefulness for realistically evaluating the cumulative effects of water use in the Columbia River Basin."

and would be actively employed to augment flows for salmon.[12] In other words, NMFS calculated the Bureau's effect on streamflow as the sum of: (1) the depletions that NMFS attributed to Bureau-based irrigation and (2) the volume of water that would have been available if the Bureau reservoirs were actively operated for flow augmentation. Thus, NMFS treated the failure to dedicate Bureau reservoirs to flow augmentation as an "effect of the action" for the operation of Bureau projects.

This approach confuses the "effects of the action" with mitigation measures. Properly understood, the *effects* of Bureau operations are the reductions in flow during the salmon migrations that result from storing irrigation water in Bureau reservoirs. NMFS has in the past prescribed the release of some portion of that storage as *mitigation*.[13] Under the ESA, NMFS is supposed to look solely at the effects of the action *before* it determines the appropriate mitigation. The effects of an agency action are not the sum of the action's actual effects plus the failure to use the agency's facilities for some alternative purpose. This would be akin to saying that the environmental impacts of a proposed highway are the habitat degradation resulting from construction plus the failure to use the entire project budget to purchase wildlife habitat. The ESA does not permit NMFS to measure the Bureau's actual operations against some artificial scenario that sweeps agriculture from the landscape of southern Idaho and then assumes that Congress would have authorized and funded major water projects for fish flow augmentation purposes.

B. The Bureau's Upper Snake River Operations Are Not A "Major Impediment" To Achieving Flow Objectives.

1. Bureau Storage Operations Increase Flows During The Summer Migration Period.

William T. Ondrechen, Technical Hydrologist with the Idaho Department of Water Resources, has examined actual Bureau reservoir storage operations for the period 1928 through 1998. Mr. Ondrechen's report is attached hereto as Exhibit 2 and incorporated herein by this reference. His analysis demonstrates that a substantial portion of Bureau storage occurs in the winter and that the reservoirs generally reach their point of maximum storage by June. The Bureau stored water – and hence reduced natural flows – during July in only two years of the 70-year period of record. For the entire period of record, the Bureau's storage in the month of July amounted to 347.5 kaf in 1975 and 152.4 kaf in 1982. Storage occurred later than usual in these years because of late run-off timing. Thus, in seventy years, the Bureau reduced July flows by a *total* of 500 kaf.[14] Therefore, Bureau operations have caused virtually no reduction in flows

[12] Curiously, NMFS assumed that the flood control and power production operations at the projects would be unaffected even while irrigation uses would be entirely eliminated.

[13] Releases from Bureau reservoirs were originally developed as a mitigation in biological opinions for the FCRPS. Now, NMFS appears to be also prescribing the release of such storage as mitigation for the Bureau's upper Snake River operations.

[14] We acknowledge that the summer migration period begins on June 20, not July 1. However, our data shows the date of maximum storage only by month. We will attempt to refine this analysis and supplement our comments to address storage operations that occur between June 20 and July 1. Nevertheless, the general point holds that nearly all Bureau storage occurs in the winter and spring and that very little storage occurs during the summer when fall chinook are migrating in the river.

during the summer migration season. In fact, when return flows from irrigation are considered, the effect of Bureau operations is to actually increase flows during the summer. Mr. Ondrechen calculates that return flows from Bureau-based irrigation that reach the river during the salmon migration periods amount to approximately 400 kaf annually. Thus, the net effect of Bureau operations is to increase flows for migrating juvenile fall chinook.

2. Bureau Storage Operations Have No Significant Effect On The Achievement Of Flow Objectives During The Spring Migration Period.

As explained above, the impact of Bureau operations on streamflows occurs at the time water is stored, not at the time stored water is released. Mr. Ondrechen has examined historical reservoir storage patterns at Bureau reservoirs in the Snake River. Figures 1 and 2 show the change in storage at Bureau reservoirs from November 1 to March 31 and from March 31 to the time of maximum storage, respectively, for the period 1928 through 1998. Mr. Ondrechen has arranged the years by run-off volume, from lowest to highest.

Figure 1

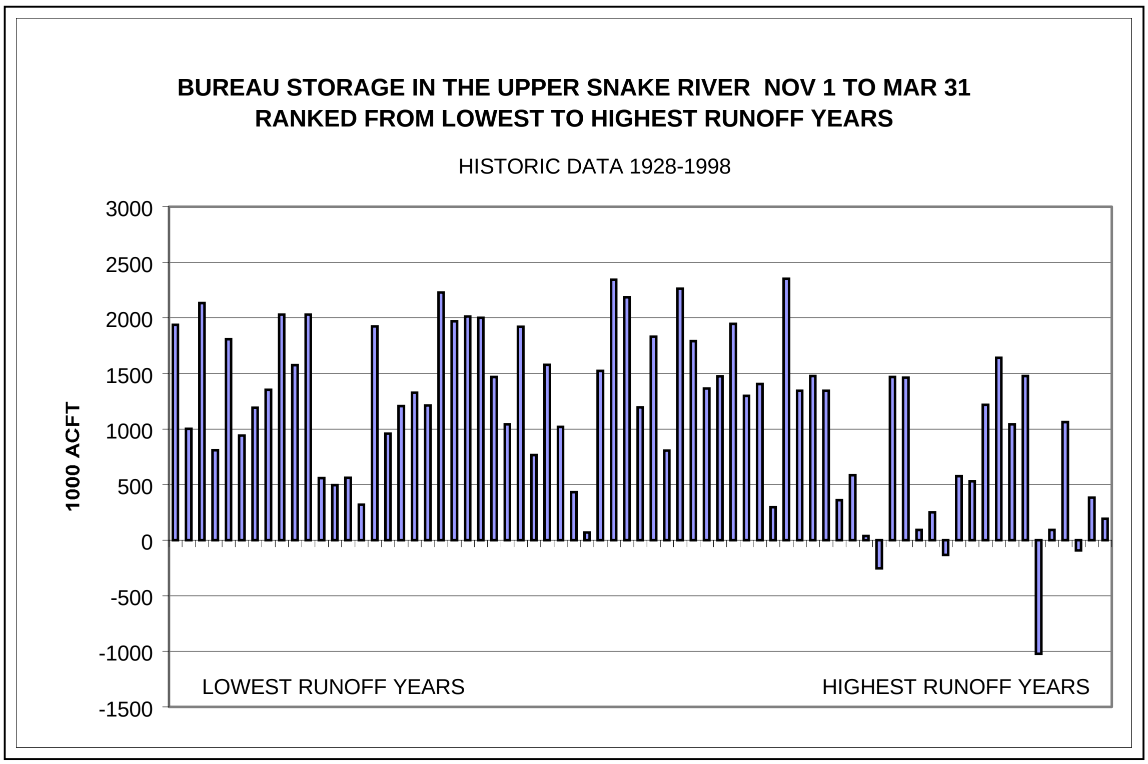
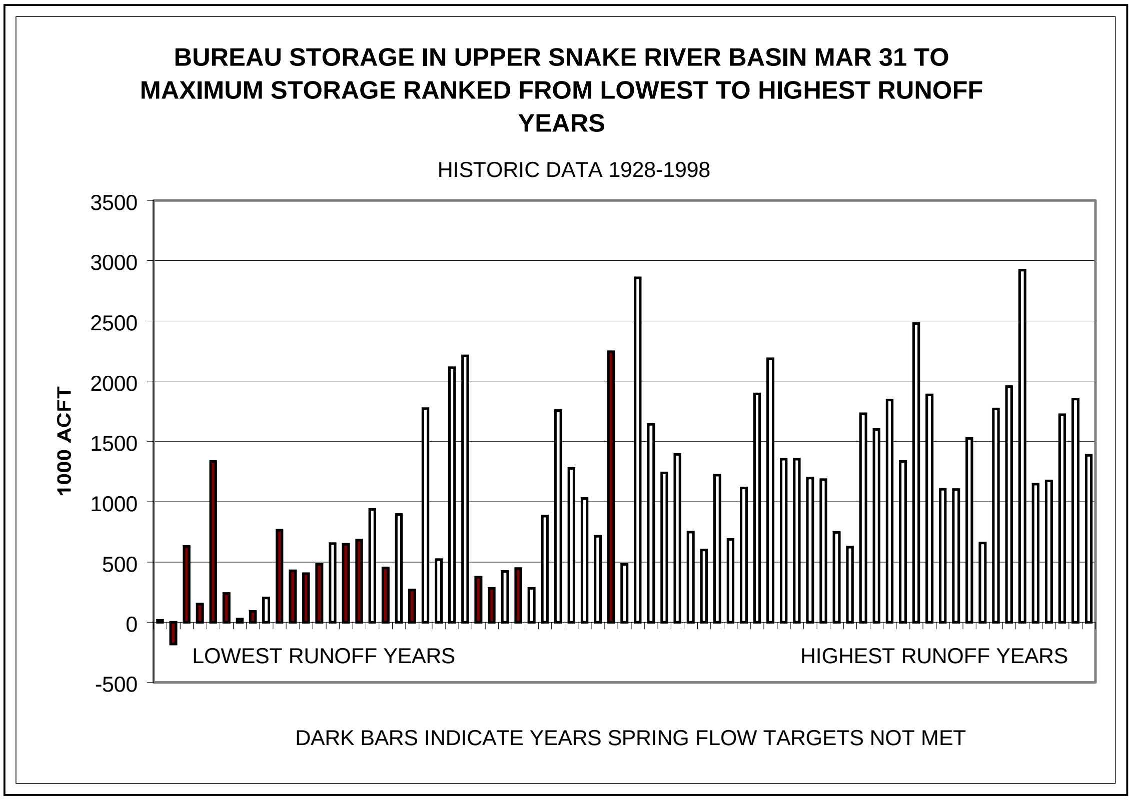


Figure 2



Figures 1 and 2 reveal a clear pattern in Bureau storage operations. Much of the storage occurs during the November 1 through March 31 period, outside the fish migration seasons. In dry years, when flood control drafts are typically smaller, most of the storage occurs during the winter, and little storage occurs during the spring migration period.

Figure 3 shows the total volume of water at Lower Granite Dam during the spring migration season and the volume of water stored after April 1 in Bureau reservoirs in the Snake River for those years when spring flow objectives were not met.

Figure 3

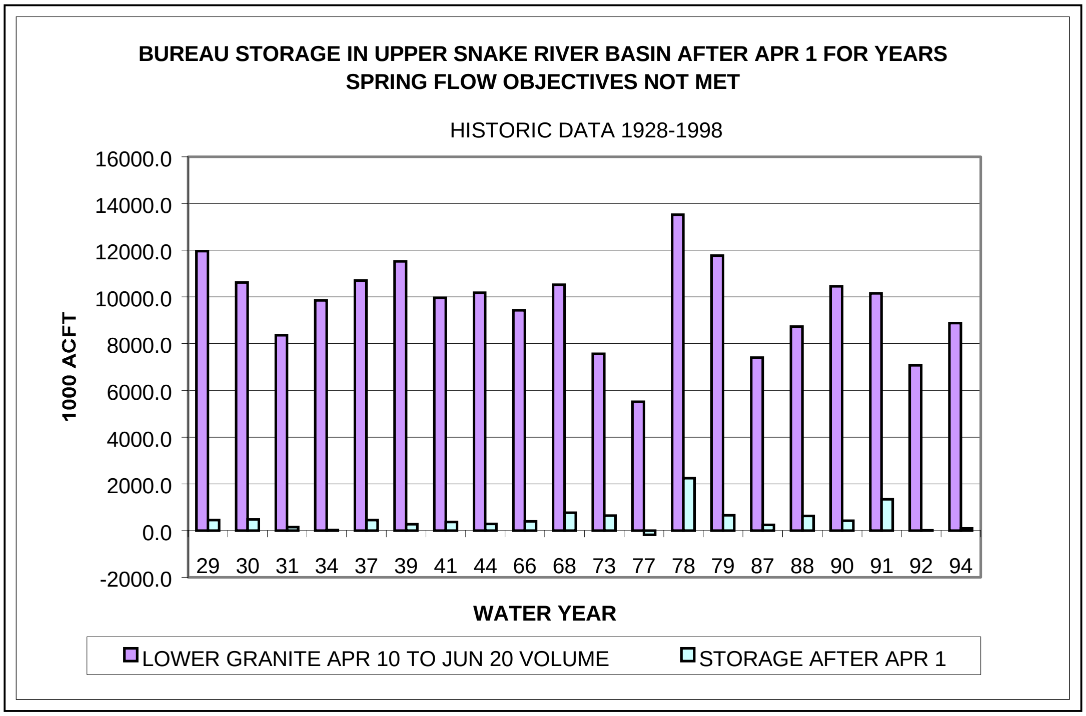


Figure 3 demonstrates that Bureau storage operations in the upper Snake River Basin have only a minor effect on the total volume of water reaching Lower Granite Reservoir. This effect is too small to permit NMFS to conclude that Bureau storage operations are a "major impediment" to the achievement of the spring flow objectives as asserted by the BiOp at page 6-28.

C. Historic Flow Data Shows Only Slight Changes In The Flows At Lewiston In The Spring And Summer Migration Periods.

Historic data on Snake River flows from 1916 to the present provides an important source of information on the effects of Bureau projects on Snake River flows. Nearly all of the Bureau water storage projects in the upper Snake River Basin were constructed after 1916, the date when water flow data began to be recorded in the Lower Snake River at Lewiston.[15] If the Bureau projects were responsible for significant depletions in flows, then the data should show a significant declining trend in lower Snake River flows. However, this is not the case.

[15] A table showing the date of first storage in Bureau projects in the upper Snake River Basin is included as Attachment 5 to Exhibit 5.

Figure 4

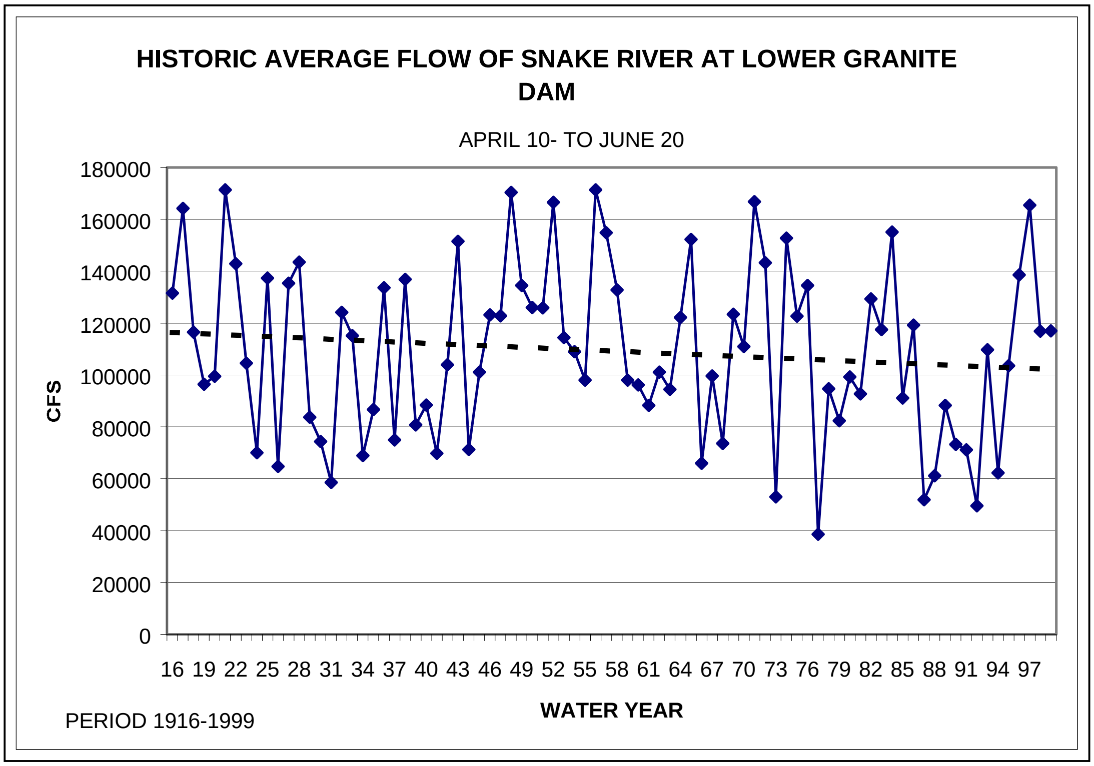
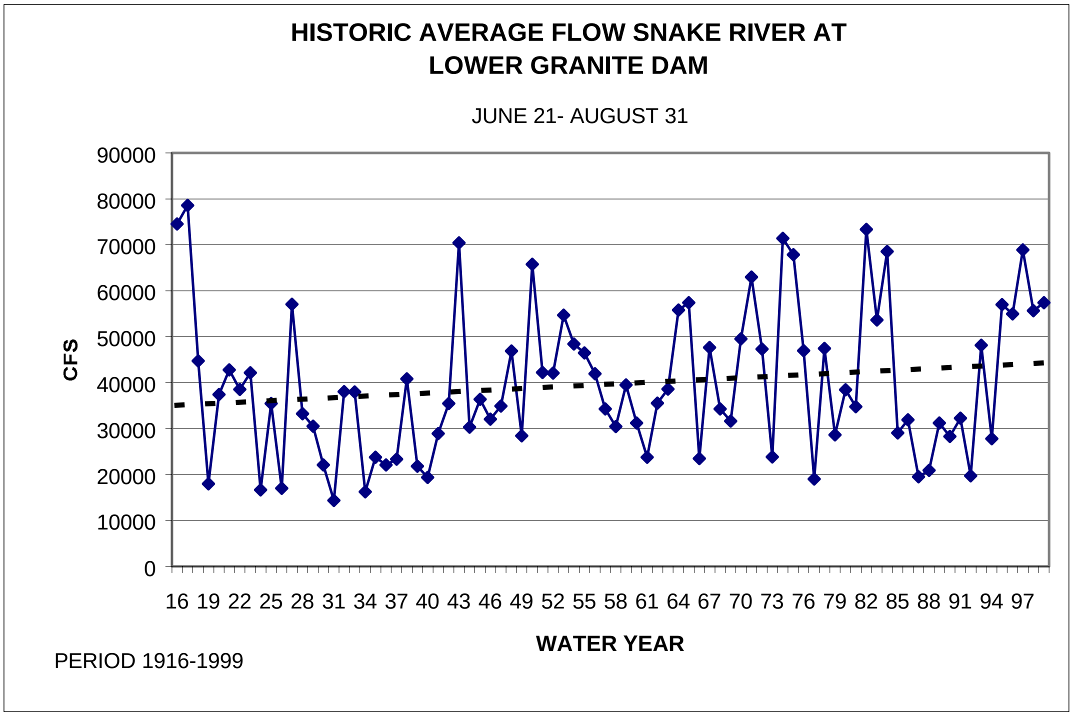


Figure 5



The Snake River flows shown in Figures 4 and 5 (above) are averages of the average daily flows during the two 72-day time periods for which NMFS, in its 1995 BiOp, has specified flow objectives at Lower Granite Dam: April 10 through June 20 (spring flow period, shown in Figure 4) and June 21 through August 31 (summer flow period, shown in Figure 5). As an aid to evaluating the historical flows, a linear trend line was calculated for the flows for both the spring and summer flow periods. These figures illustrate that during the historical period in which Bureau projects were developed in the upper Snake River Basin, there have been no apparent changes in flows at Lower Granite Dam during either of the key migration periods. Indeed, there has been a slight increase in flows during the summer flow period, despite ongoing irrigation withdrawals. Note that these data reflect the effect of all water development in the Snake River Basin, including the construction of the Dworshak Dam and the Hells Canyon Complex.

We recognize that the precise slope of the trend line is sensitive to the timing of wet and dry years within the period of record. Nevertheless, the point still holds that Snake River flows have not declined dramatically since 1916. If, as the BiOp suggests, the operation of Bureau projects were a "major impediment" to meeting flow objectives, a distinct and sustained downward trend in flows would emerge from the data. No such trend is evident.

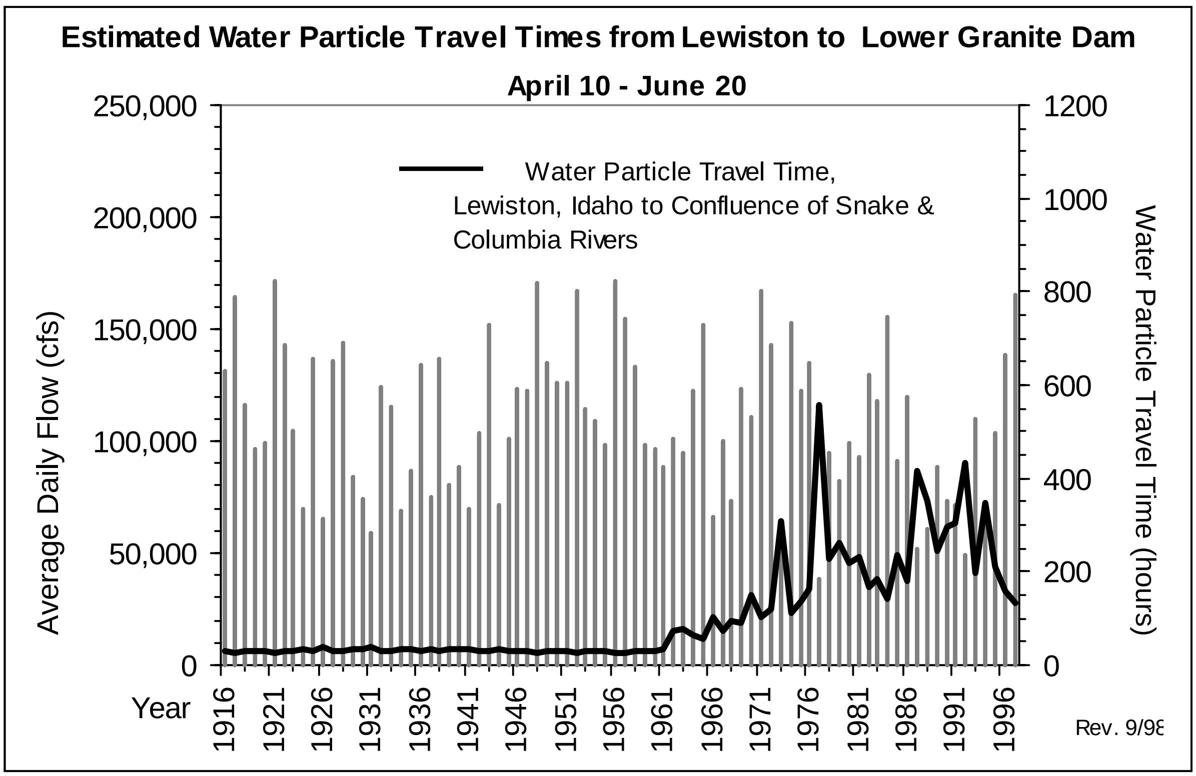
The fact that lower Snake River flows have not changed significantly since 1916 is important because analyses conducted by the Process for Analyzing and Testing Hypotheses ("PATH") concluded that the productivity of Snake River spring/summer chinook populations remained healthy through the 1950s and into the 1960s. The Bureau's system of reservoirs in the upper Snake River Basin was substantially completed with the construction of Palisades Dam in 1956, prior to the loss of productivity that eventually led to the listing of Snake River salmon and steelhead stocks. This means that the sharp loss of productivity since the 1960s cannot be attributed to the effects of Bureau operations on streamflows. This analysis refutes NMFS' conclusion that the upper Snake River Bureau projects significantly contributed to the decline of the listed species. It is also noteworthy that recovery thresholds established for spring/summer chinook are only 60 percent of the average number of pre-1970s spawners; the recovery threshold for fall chinook is 2,500 adults, far below pre-1970s escapements.

D. The FCRPS Dams Have Much Greater Impacts On The Hydrologic Characteristics Of The Lower Snake River Than The Bureau Projects.

NMFS' analysis of the impacts of Bureau operations cannot be complete until the BiOp includes a discussion of the relative impacts of the Bureau projects versus the mainstem FCRPS projects on the lower Snake River. The mainstem projects transformed a formerly free-flowing river into a series of reservoirs and thereby increased the cross-section of the river. The mainstem FCRPS projects decreased the velocity of the lower Snake River to about one-sixth of its previous level.

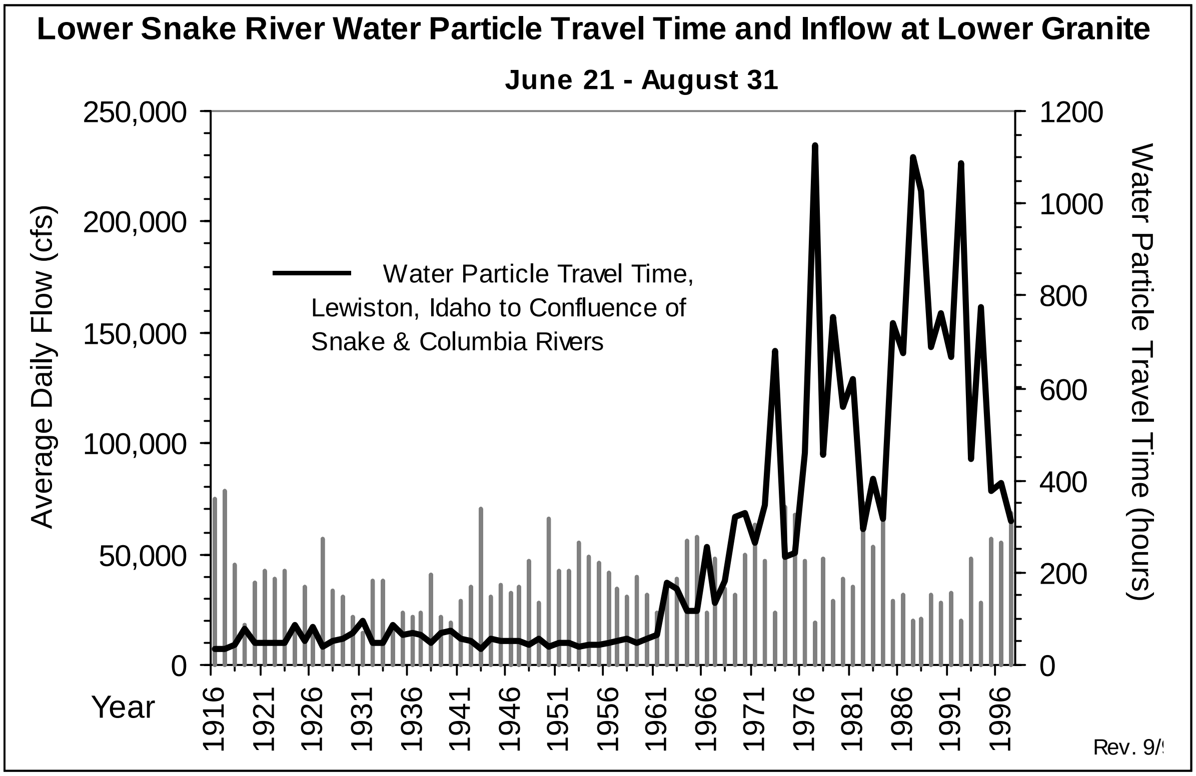
Figures 6 and 7 show lower Snake River flows and estimated water particle travel time from Lewiston to the confluence of the Snake and Columbia Rivers.[16] The figures dramatically illustrate three points. First, lower Snake River flows are extremely variable. These variations chiefly reflect the substantial swings in precipitation and snowmelt between wet and dry years. Second, prior to the construction of the lower Snake River FRCPS dams, flow variations had little effect on river velocity. During the spring migration season, water particle travel time for the lower Snake River was under 48 hours in all years – including the severe drought years of the late 1920 and early 1930s. This represents the hydrological condition to which the listed species adapted. Third, the effect of the lower Snake River FCRPS dams was to increase water particle travel time to levels that were entirely unprecedented in the pre-dam era. Water particle travel time in the spring is now about 10 days in average flow years and seldom gets as low as 6 days.

Figure 6



[16] Water particle travel time is the theoretical length of time that it would take a particle, suspended in a volume of water flowing at a given rate, to travel some specified distance. Water particle travel time can be calculated by determining the total volume of water within a particular river segment at a particular rate of flow and dividing that volume by the corresponding volumetric rate of flow. For the conditions represented in the figures, the average daily flow during the spring flow objective period and summer flow objective period for a particular year, respectively, is the given volumetric flow. The specified distance is the length of the river segment from between the confluence of the Clearwater and Snake rivers to the confluence of the Snake and Columbia Rivers, about 140 miles.

Figure 7



Figures 6 and 7 demonstrate that the Bureau projects were not a substantial cause of the changes in the hydrological character of the lower Snake River. All of the Bureau projects in the Snake River Basin were completed prior to the completion of the four lower Snake River FCRPS dams.[17] The mainstem FCRPS projects on the lower Snake River were completed between 1963 (Ice Harbor) and 1976 (Lower Granite). Prior to the construction of the mainstem FCRPS projects, river velocity was virtually unaffected by variations in flow – either natural or human-induced. Pre-dam water particle travel time remained in a narrow band regardless of the volume of inflow. After the completion of Ice Harbor Dam in 1963, and with each successive FCRPS project, water particle travel time increased greatly. Thus, it is apparent that the effects of the lower Snake River FCRPS dams on river velocity overwhelm any alleged flow effects of Bureau operations. Current river velocity is approximately one-sixth of the historical condition to which the fish adapted over millennia. The river's water temperature, substrate, and riparian functions have also been substantially altered by the mainstem projects.

These points are not merely of historical interest; they have important implications for NMFS' current decisions. The current Snake River flow augmentation program consists of micro-managing relatively tiny increments of flow through a system that has been fundamentally transformed by the mainstem FCRPS projects. The marginal increases in river velocity produced by upper Snake River flow augmentation provide infinitesimal increases in survival and accomplish virtually nothing toward returning the river to the conditions to which the fish adapted. In short, little can be gained by pouring more water through a series of reservoirs.

[17] A table showing the volume and the date of initial storage of Bureau projects is Attachment 5 to Exhibit 5.

The basic hydrology of the upper Snake River Basin further reduces the effectiveness of flow augmentation. As an initial matter, that portion of the basin has relatively little controlled storage. The Bureau's Snake River Basin reservoirs do not reliably refill every year due to the generally arid nature of the basin. Moreover, nearly two-thirds of the inflow to the lower Snake River reach comes from basins with little or no controlled storage, notably the Salmon, Middle Fork of the Clearwater, Grande Ronde and Imnaha rivers. These hydrologic facts mean that flow augmentation has limited influence on the physical environment of the lower Snake River.

E. The BiOp Correctly Concludes That It Considers All Known Operational Effects Of The Bureau Projects In The Upper Snake River Basin.

At page 1-3, the BiOp states: "This Biological Opinion also considers all known operational effects of the BOR projects located upstream from Chief Joseph Dam and upstream from Hells Canyon Dam." We agree with this statement. However, some groups have questioned whether Bureau-based irrigation may affect migrating salmon by increasing the temperature of the lower Snake River migration corridor. NMFS should address this contention in the final BiOp and conclude, based upon the best available scientific information, that this concern is too remote and speculative to warrant further analysis in the BiOp.

We are aware of no analysis that supports the contention that Bureau operations have any effect on the temperature of the lower Snake River. The allegation that Bureau-based irrigation adversely affects temperature appears to be based on an intuitive notion that irrigation return flows are warmer than the water diverted from the river and that reservoir storage increases water temperature. Three points rebut this contention:

(1) Only a relatively small portion of the return flows from Bureau-based irrigation returns as surface flow. Mr. Ondrechen estimates in his analysis in Exhibit 2 that surface return flow accounts for only 20 percent of the total return flow. The remainder of return flow from Bureau-based irrigation comes back to the river from ground water sources. This return flow is actually substantially cooler than river temperatures during the summer. The cooling effect of ground water return flow provides a local benefit to resident fish. For instance, the discharge of the Snake River Plain Aquifer in the region of the Thousand Springs has increased by roughly 2,000 cfs as a result of irrigation started on the lands overlying the aquifer. This water reaches the Snake River at about 14 degrees centigrade, far cooler than the average temperature of the Snake River during July and August.

(2) The Bureau reservoirs and Bureau-based irrigation are located hundreds of river miles upstream from the salmon migration corridor. Ambient air temperature exerts a substantial influence on river temperatures through this long reach and tends to dissipate the temperature effects of reservoir storage and irrigation return flows.

(3) Major non-Bureau reservoirs are located between the Bureau reservoirs and the lower Snake River, including the pools behind Lower Salmon Falls, Bliss, C.J. Strike, Swan Falls, Brownlee, Oxbow and Hells Canyon dams. Together, these

reservoir pools add up to more than one-hundred river miles. The temperature effects of these reservoirs likely mask any effects of Bureau operations.

Given these facts, NMFS has reasonably concluded that the flow depletion effects of Bureau projects are the only impacts that need to be assessed in the BiOp. In any case, the BiOp should explain that the alleged temperature effects of Bureau operations are too remote and speculative to warrant separate consideration in the document.

F. Conclusions Regarding Effects Of The Bureau's Upper Snake River Operations.

We request that the BiOp reflect each of these following conclusions regarding the impacts of the Bureau storage operations in the upper Snake River Basin:

(1) The primary analysis used to characterize the impacts of Bureau-related irrigation (Tables 6.2-1 and 6.2-2) contains substantial flaws that tend to overestimate the impacts of the Bureau projects;

(2) A substantial portion of the storage in Bureau reservoirs occurs during the winter, before the salmon and steelhead migration;

(3) Bureau storage operations do not reduce flows during the summer migration season (June 21 through August 31);

(4) Bureau storage operations do not significantly affect the likelihood of achieving flow objectives during the spring period;

(5) The volume of return flow from Bureau-based irrigation that reaches the rivers during the salmon migration is approximately 400 kaf;

(6) The Bureau reservoirs were constructed significantly prior to the loss of productivity in Snake River spring/summer chinook stocks that led to their listing; and

(7) Any impact from Bureau storage operations is insignificant relative to the effects of the mainstem FCRPS projects.

The BiOp should conclude that, while it is not possible to estimate the effects of Bureau operations with precision, these effects appear to be insignificant and, in some cases, actually beneficial to the listed species.

III. Chapter 9: Reasonable And Prudent Alternative.

A. The BiOp Should More Expressly Discuss Factors Considered In Developing In The RPA.

The BiOp does not shed much light on the considerations that NMFS took into account in developing the RPA. We recommend that additional narrative be included in the BiOp to illuminate the bases for NMFS' decision. This narrative will make the document more understandable. In particular, NMFS should better explain its consideration of feasibility and trade-offs among alternative courses of action. The BiOp's current discussion of these issues is brief. The document notes that:

> NMFS looks beyond the particular action area for this analysis to consider measures likely to be necessary in all life stages that, in combination, would insure that the biological requirements for the listed species will be met and thereby insure its continued existence. (BiOp at 1-7)
>
> Recovery planning will identify the feasible measures that are needed in each stage of the salmonid life cycle for conservation and survival within a reasonable time. Measures are feasible if they are expected both to be implemented and to result in the required biological benefits. (BiOp at 1-9)
>
> Hydrosystem performance standards include specific adult and juvenile survival levels (direct and indirect) expected to result from implementing the best and most aggressive actions that NMFS and the Action Agencies agree are biologically and technically feasible and within the authority of the Action Agencies. (BiOp at 9-1)

These statements are helpful, and, as far as they go, we agree with them. However, it would be useful for the BiOp to be more specific about how NMFS weighed the reasonableness and prudence of the measures it included in its "reasonable and prudent alternative." NMFS often characterizes this issue as one of "feasibility."

Feasibility is appropriately considered in biological opinions in at least three different ways. First, particular measures or survival improvements may be infeasible in the sense that they simply cannot be achieved regardless of the degree of effort. The BiOp's estimates of potential survival improvements during the freshwater rearing stage may fall into this category. Second, a measure may be technologically or economically infeasible, in which case it cannot be required as a reasonable and prudent alternative in a biological opinion. 50 C.F.R. § 402.02 (definition of reasonable and prudent alternative). Third, and perhaps most fundamentally, questions of feasibility and adverse impacts are relevant to how NMFS weighs trade-offs among alternative measures. The BiOp sets forth a broad range of potential measures to conserve listed salmon and steelhead stocks. NMFS should carefully consider the social, ecological, and economic impacts of each of these measures before it selects the specific mix of measures that are feasible.

Feasibility considerations should lead NMFS to give priority to those actions that most effectively contribute to increasing salmon survival while minimizing costs and environmental impacts. All management measures should be evaluated based on: (1) their estimated biological benefits, (2) the certainty of those benefits, (3) the number of ESUs benefited, (4) the amount of time required to realize the biological benefits, and (5) the degree to which the measure addresses the primary factors limiting survival and recovery. The costs and the environmental and economic impacts of a potential measure should also be evaluated. An unacceptably high cost, or a cost disproportionate to the benefits provided, should reduce a measure's desirableness as a component of a reasonable and prudent alternative. If biological standards can be achieved with more than one combination of actions, then a comparison of the relative benefits and costs of alternative combinations becomes relevant. Selection of a combination that achieves desired results with a reasonable degree of certainty and for less cost relative to the survival improvement than another combination increases the effective use of financial resources. The consideration of the trade-offs among alternative actions lies at the heart of the recovery planning effort. It would make no sense to impose high cost and high impact measures in one part of the Columbia Basin while ignoring opportunities to improve salmon survival with lower costs and impacts in some other part of the Basin.

The State of Idaho has one additional suggestion for a change in the BiOp's discussion of feasibility. At page 9-1, the BiOp states: "Hydrosystem performance standards include specific adult and juvenile survival levels (direct and indirect) expected to result from implementing the best and most aggressive actions that NMFS and the Action Agencies agree are biologically and technically feasible and within the authority of the Action Agencies." This statement omits the requirement that reasonable and prudent alternatives must also be economically feasible. 50 C.F.R. § 402.02. The State of Idaho requests that the statement be amended to reflect the regulatory definition of reasonable and prudent alternative.

B. The BiOp Should Clarify The Role Of Performance Standards In Reviewing The Effectiveness Of The RPA Measures.

As a general matter, we agree that it is appropriate for NMFS to develop performance standards addressing the following elements:

- FCRPS adult survival per project and for the entire system;
- FCRPS juvenile survival in-river and FCRPS combined;
- Survival improvement over the entire lifecycle needed to meet the jeopardy standard; and
- Physical performance standards based on the hydropower measures described in Chapter 9.

Although the general categories of performance standards are appropriate, the BiOp should discuss further the consequences of a failure to meet one or more of the standards. NMFS should anticipate the questions that may arise in the future. For instance, what happens if one of the physical performance standards for a particular downstream measure is not met but the juvenile system survival standard is met? Or, what happens if the adult survival per project standard is not met but the overall survival improvement needed to avoid jeopardy is met?

The FCRPS performance measures identified above should also include the full range of potential impacts resulting from the hydrosystem experience. This should include both direct and delayed mortality associated with inriver migration or smolt transportation.

The BiOp should acknowledge that precipitation, ambient air temperatures, and ocean conditions will play an important role in the determining whether the performance standards are achieved. For instance, favorable snowpack and ocean conditions, plus salmon recovery measures taken to date, have combined to produce stronger runs this year and the prospect for even better returns next year. However, continued good fortune is not guaranteed. It is possible that drought and adverse ocean conditions could cause poor life-cycle survival during the implementation period regardless of the action agencies' success in implementing the measures contained in the document. Conversely, favorable run-off and ocean conditions should not be permitted to mask failures to move forward with the salmon recovery program. The final BiOp should state that the determination of whether the intent of the performance standards has been met will take weather and ocean conditions into account.

C. The BiOp Must Clarify the Role of Flow Objectives.

The BiOp offers a mixed message regarding the purpose and intended use of the flow objectives. On the one hand, the BiOp recognizes that the flow objectives are not hard constraints, may not be achievable with poor run-off conditions, and should be used simply as in-season management tools to best utilize the natural and augmented flows that are available. Flow objectives cannot serve as either a specific RPA measure that must be implemented or as a hard performance standard that must be achieved because the flow objectives are generally met only when natural run-off conditions are favorable. NMFS cannot reasonably hold the action agencies accountable for the vagaries of natural run-off, which is highly variable, particularly in the Snake River. In fact, holding the objectives out as such a standard sets the RPA up for failure since the objectives are not reliably achievable. Instead, NMFS should clearly state that the flow objectives are tools for in-season management of specific volumes of water and of the Corps' flood control operations. This tool is intended to ensure that the measures contained in the RPA are implemented in a manner that is most responsive the biological needs of the listed species.

1. The Original Development Of The Flow Objectives Reveals That The Objectives Are Not Based On Any Meaningful Biological Threshold For Chinook Survival.

The problems we discuss in this section do not address whether fish benefit from flow but rather focus on NMFS' selection of essentially arbitrary threshold flow levels as "objectives" and the subsequent misuse of those objectives to mask more meaningful analysis of the biological benefits of the flow augmentation program.

NMFS' explanation for the particular flow ranges selected and labeled as "flow objectives" was set forth in an appendix to the 1995 Biological Opinion. As for the spring flow objective in the Snake River, NMFS offered three factors for its selection of 85-100 kcfs during April 10-June 20.[18] First, NMFS pointed to studies by Raymond in 1988 and by Petrosky in 1991 and 1992 which estimated smolt to adult returns (SARs) of Snake River spring chinook to be less than .25 percent when mean flows between April 20 and May 30 were below 85 kcfs; whereas, at mean flows above 85 kcfs, SARs "were often higher . . . although they were also low in some years." NMFS concluded these studies "suggest that survival can be high or low at mean flows above 85 kcfs but survival is always low at mean flows below 85 kcfs." Second, NMFS pointed to a 1993 study by Berggren and Filardo which found that travel time in the lower Snake River was reduced from 16 days to 8.3 days as flow increased from 55 kcfs to 180 kcfs, with the most pronounced relationship at flows below 120 kcfs. NMFS noted that 85 kcfs is the mid-range of 55-120 kcfs. Third, NMFS noted that 85 kcfs is at the lower end of the 80-210 kcfs range of pre-dam outmigration flows under which the fish evolved. From these factors NMFS concluded "85 kcfs is a low estimate of the flows that reduce the likelihood of high mortality." 1995 BiOp, Appendix A.

Even taking these three factors in their most positive light, they do not prescribe a specific biological trigger at a minimum 85 kcfs flow. While the Raymond and Petrosky studies are often cited to support a flow-survival relationship for spring chinook, they do not support a finding that 85 kcfs represents a specific threshold level above which survival is adequate and below which it is not. The asserted flow-survival relationship is a general relationship that applies across a broad range of flows; it does not support a specific trigger point. The data simply are not strong enough to state that some particular flow level will produce some specific level of smolt-to-adult survival. The flow objective thus lends a false sense of precision to flow management.

NMFS' second factor (the reduction in fish travel time as flows increased from 55 kcfs to 180 kcfs) merely suggests that 85 kcfs falls within a range of flows thought to improve travel time but does *not* prescribe 85 kcfs as any threshold for which flow should be managed to improve travel time. Likewise, NMFS' suggestion that 85 kcfs falls within a range of pre-dam flows does not prescribe any biologically-based minimum threshold for flows. In fact, NMFS acknowledges the weakness of its third factor when it states that water velocity and smolt travel time associated with 85 kcfs in a pre-impounded river is entirely different from the effects of 85 kcfs now. Notably, NMFS did not offer any explanation of why 100 kcfs was selected as the upper end of the range or why April 10-June 20 was selected as the range of dates for that target. Indeed, the only dates mentioned in the studies were April 20-May 30.

As for the summer flow objective of 50-55 kcfs during June 21-August 31, NMFS' explanation presents an even more tenuous connection to biological considerations than did the spring objective. NMFS offered four factors as its basis for selecting the summer objective dates and amounts. First, NMFS pointed to a 1993 study by Connor et al. which found "that *if* a flow of 50 kcfs *would have been maintained* over the summer emigration period with water temperatures above 15.4 degrees C, the average emigration rate to Lower Granite would have

[18] NMFS has since moved the beginning of the flow objective period back to April 3.

been 53% faster than occurred in 1992." (Emphasis added.) NMFS later noted that this same study found that higher water temperatures result in faster emigration rates. Second, NMFS pointed to a 1994 study by Berggren which found that for fish at least 85 mm in length, at a given temperature, travel time at flows less than 50 kcfs was less than half that with flows at 25 kcfs. Third, NMFS pointed to a 1993 finding of the Fish Passage Center that increased flow causes a reduction in travel time up to 110 kcfs, with a pronounced relationship up to 70 kcfs. Fourth, NMFS noted that 50-55 kcfs is lower than the mean historical flows of approximately 109 kcfs during the historical run time—approximately June. NMFS concluded from these four factors that "[b]ecause observations in 1993 indicate that mortality decreased substantially at flows averaging 50 kcfs, and travel time does decrease with higher flows at a given temperature, a flow range of 50-55 kcfs appears reasonable." 1995 BiOp, Appendix A.

Once again, even taking NMFS' factors at face value, they do not prescribe a specific biological trigger for the establishment of a flow threshold at 50-55 kcfs. Rather, the studies presented discuss a general flow-survival relationship that occurs over a large range of flows and involves interplay from several other factors. The studies do not separate out the effects of particular flow regimes on survival from temperature, release date and other effects. In fact, NMFS plainly acknowledged that "fall chinook migration is a multivariate and continuous relationship, involving at least fish size, water temperature and flow, making choice of a particular flow/temperature regime difficult." NMFS further acknowledged that the water velocity and smolt travel time associated with 50-55 kcfs in a pre-impounded river is largely different from the effects of 50-55 kcfs now. Thus, historic range of flows are not reasonable indicators of survival needs or flow feasibility today.

In sum, NMFS' rationale for selecting the specific flow objectives does not reflect any inherent biological significance of the actual flow levels selected. Accordingly, the objectives should not be held out as representing any biologically-significant threshold for fish survival and should not be elevated to the status of defining minimum flow levels the action agencies must meet.

2. The Present Draft BiOp Does Not Offer A Consistent Description Of How Flow Objectives Are Intended To Be Used.

In this BiOp, NMFS appropriately concludes that the Snake River flow objectives cannot be reliably met. First, NMFS correctly notes that the Snake River objectives (especially in summer) are unlikely to be met (BiOp at 9-43, 9-44, Table 6.2-5, & Table 9.7-4). Second, NMFS properly concludes that "there is limited value in using flow objectives that cannot be achieved as a benchmark for in-season management decisions" (BiOp at 9-40) and, further, that flow objectives are "not hard constraints" (BiOp at 9-43) and are not an end in themselves (BiOp at 9-44). Indeed, the RPA's proposed measures do not actually contribute to meeting the Snake River flow objectives but, instead, turn toward other survival improvements to avoid jeopardy. (BiOp at Table 6.2-5 & Table 9.7-4).

Certain language in the BiOp, however, creates confusion regarding the role of the flow objectives by suggesting that the flow objectives reflect a standard for measuring the success of the RPA. For example, in Section 9.2.3, at page 9-14, the BiOp discusses flow objectives as a physical performance standard: "In the case of hydro actions, for example, there are some physical targets or objectives directed at measures such as mainstem flow objectives and water quality that are intended to guide water management decisions." Likewise, in Section 9.6.1.1.1, at page 9-35, NMFS improperly suggests that flow objectives are an RPA "measure": "This RPA continues many of the 1995 Biological Opinion and 1998 and 2000 Supplemental Biological Opinion measures, including the following: Flow objectives as Lower Granite, Priest Rapids, McNary, and Bonneville dams. . . ." These statements should be modified so that they are consistent with NMFS' conclusion that flow targets are not "hard constraints."

If the action agencies were required to do everything possible to meet flow objectives, they would in many years have to draft reservoirs far below the draft points set forth at pages 9-45 through 9-47 of the BiOp. This would endanger refill (i.e., the ability to supply flow augmentation the following year) and have significant adverse consequences on resident fish and wildlife. Such unlimited drafts would also conflict with the detailed prescriptions that NMFS has laid out for the operations of the FCRPS and Bureau projects at pages 9-45 through 9-47 and 9-50 through 9-53. It is our understanding that the action agencies have never been required to conduct unlimited drafts of reservoirs in an effort to meet flow objectives. Thus, flow objectives do not establish a "floor" for the amount of flow augmentation to be provided. The BiOp also makes it clear that the flow objectives are not a "ceiling." The document states that flow augmentation efforts will continue even when the flow objectives are exceeded. BiOp at 9-43. If the flow objectives are neither a floor nor a ceiling and do not define the obligation of the action agencies, then the logical question is: what *is* the role of the flow objectives in the BiOp?

The BiOp at page 9-43 squarely answers this question:

> Flow objectives serve as a guide to manage available water resources during the juvenile salmon migration and provide a reference for comparing various operational scenarios that may affect inriver migration conditions. They are not hard constraints. . . . Rather, the flow objectives provide general guidance to the Action Agencies and the technical management team, discussed in Section 9.5.2.2 for its in-season management considerations.

In other words, the flow objectives provide a point of comparison that helps in-season managers prioritize when water should be released for fish. This use of the flow objectives makes sense because the concept is applied as an aid to decision-making in a specific management setting rather than set forth as an expectation that the hydrosystem cannot meet. These objectives should also be used to guide shifts in flood control operations to optimize water management for migrating fish while keeping flood risks at acceptable levels.

NMFS' statement that the flow objectives are best understood as an in-season management tool is consistent with Snake River Salmon Recovery Team's rationale for rejecting flow objectives as hard constraints in 1995. Recovery Team Chairman Don Bevan explained in the 1995 Hydro Administrative Record (BOR) 589, attached hereto as Exhibit 6:

> It is obvious that water, like any scarce resource should be managed through the year and that real-time decisions based on the best scientific information and

> judgment are the best way to ensure that available water provides the maximum biological benefits. The Team rejects the concept of a flow target. . . . Things change on the river. If you lock yourself into a target you can't make, then you may drain reservoirs that won't refill the next year. Your target can damage you, if not that year, then later on. . . . It's too inflexible to match nature's variability.

Although the BiOp at page 9-43 provides that flow objectives are a guide for in-season management, it does so four pages and two actions items after the RPA measure directing the action agencies to "operate the FCRPS dams and reservoirs considering the flow objectives." BiOp at 9-39. Elsewhere, the BiOp refers to "Measures to Evaluate and Adjust the Amount of Water Available for Flow Objectives." BiOp at 9-50. These statements tend to confuse the role of flow objectives in hydropower system operations. It would be more accurate and appropriate for the BiOp to state at page 9-39 that the "Action Agencies are to operate FCRPS dams and reservoirs to augment flows for the benefit of listed species" and at page 9-50 that they are to undertake "Measures to Evaluate and Adjust the Amount of Water Available for Flow Augmentation."

One important reason to clearly state that the action agencies are not obligated to meet flow objectives is that key stakeholders – including potential litigants in future challenges to the BiOp – have become confused on this point. For instance, as recently as this summer, the plaintiffs in <u>Trout Unlimited v. NMFS</u>, Civ. No. 00-262 MA (D. Or.), argued that the inability to meet flow objectives every year demonstrated that the action agencies were violating existing BiOps and/or that the BiOps were arbitrary and capricious. In the past, Judge Marsh of the United States District Court for the District of Oregon has rejected such assertions on the basis that the plaintiffs had mischaracterized the flow objectives as daily or weekly averages rather than seasonal averages as provided in prior BiOps. This holding, however, did not reach the more fundamental issue: flow objectives were never intended as a specific measure to be implemented by the action agencies.

NMFS and the action agencies have always readily admitted – as they must – that the flow objectives are not always achievable. In fact, Table 9.7-4 in the BiOp reveals that the flow objectives will be missed in a high percentage of years even with the measures contained in the RPA. The table shows that the probability of meeting flow objectives at Lower Granite Dam on a monthly basis varies from 0 percent to 70 percent. This shortfall occurs because available storage cannot make up for annual variations in precipitation and run-off, nor natural base flows that are below flow objectives. The disparity in natural run-off between dry years and wet years is so vast that it dwarfs the action agencies' ability to compensate for low flows through reservoir releases, although available storage can help moderate periods of low flows during a given year. For this reason, the flow objectives cannot serve as a reasonable physical performance standard or RPA measure. This is particularly true for the Bureau's upper Snake River projects, because the flow objectives are not tied in any manner to the impacts reasonably attributed to these Bureau operations. Mr. Ondrechen, Technical Hydrologist with the Idaho Department of Water Resources, confirms this point in his analysis of the volume of the shortfall between actual flows and the flow objectives. This analysis is contained in Exhibit 3.

In sum, the particular flow ranges of the flow objectives are not biological thresholds and are not readily achievable in the Snake River Basin. Moreover, as discussed below, flow objectives do not reflect the specific attributes of flow that NMFS deems relevant to fish survival and recovery. Thus, they should not be labeled as a performance standard or an RPA measure. Instead, the flow objectives are a tool – a reference point – that assists in-season managers to determine how they should manage water within the terms of the RPA and that guides the Corps' pursuit of additional flexibility for flood control operations to benefit migrating fish.

3. Flow Objectives Should Be Reformulated To Reflect The Relevant Attributes Of Flow.

As discussed previously, the BiOp provides that flow objectives are to be used as in-season guides for management of the specific volumes of FCRPS flow augmentation and flood control operations called for in the RPA. However, we question whether expressing these objectives solely in terms of flow is useful. Flow in the lower Snake River has not changed dramatically since the Snake River salmon and steelhead runs were healthy and viable. What have changed are water velocity, temperature and turbidity of the lower Snake River. These are the attributes of flow that should be considered in developing in-season guides for the management of the FCRPS flow augmentation measures contained in the BiOp. Thus, management of the volumes of water and flood control operations called for in the BiOp should transition from an overemphasis on flow objectives to a focus on attributes of flow that relate to the biological needs of the fish during juvenile and adult migration periods. This approach will allow the flow augmentation measures to be assessed based on their feasibility to contribute to meeting these standards. This is a far more biologically sound approach than incrementally adding water in an attempt to meet flow objectives that do not directly address the attributes of flow important to fish. Under this approach, the action agencies would use velocity, temperature and turbidity objectives for in-season management of the specific volumes and sources of water made available under the BiOp.

D. Flow Augmentation Is Not An Effective Tool For Salmon Recovery.

The BiOp must examine the biological effectiveness, reasonableness and prudence of measures contained in the RPA. Idaho believes that potential RPA measures should be judged by four criteria:

(1) The effects of the federal action on the listed species;

(2) The extent to which a potential RPA measure addresses the factors responsible for the historical decline and the current status of the listed stocks;

(3) The effectiveness of a potential RPA measure in improving fish survival; and

(4) The relative economic and ecological impacts of a particular measure when compared to other potential measures.

The first two of these factors are addressed in our comments on Chapter 6, above. These comments indicate that operation of Bureau reservoirs in the Snake River has very minor effects on flows during the spring migration period and actually increases flows during the summer migration period. Moreover, the Bureau projects in the Snake River were fully operational prior to the steep decline in productivity of the stocks that led to their listing under the ESA.

The comments set forth below address the third and fourth criteria, the biological effectiveness and impacts of flow augmentation as an RPA measure. As explained below, flow augmentation is not a biologically effective tool for salmon recovery for three reasons: (1) upper Snake River flow augmentation is capable of producing only very small changes in the velocity of the lower Snake River; (2) data from subyearling fall chinook studies conducted by NMFS do not support use of Snake River flow augmentation to increase survival; and (3) upper Snake River flow augmentation does not cool the lower Snake River at times of elevated river temperatures. Furthermore, additional flow augmentation would cause severe economic and ecological impacts on the region.

1. Upper Snake River Flow Augmentation Provides Few, If Any, Biological Benefits.

a. Flow Augmentation Is Capable Of Producing Only Small Changes In River Velocity.

One of the assumed benefits of flow augmentation is increased channel flow velocity, which conceptually could increase the rate of downstream fish migration. However, even enormous volumes of water are capable of inducing only a very small change in the water velocity of a reservoir such as those on the mainstem of the lower Snake River. Flow augmentation is of little value as a tool for changing the river environment of the lower Snake River because there is relatively little controlled reservoir storage in the upper Snake River Basin and lower Snake River inflows are dominated by natural run-off.

This point is illustrated by examining the effect of the 427 kaf that the Bureau currently releases for salmon flow augmentation. If delivered over a 72-day migration period, a volume of 427 kaf would increase lower Snake River flows by an average of about 3 kcfs. At an average inflow of 80 kcfs, water particle travel time through the lower Snake River would be decreased from 256 hours to 247 hours – a difference of only nine hours over a period of ten days.

Even huge volumes of additional flow augmentation produce relatively small changes in the velocity of the lower Snake River. If used to augment summer flows up to 55 kcfs, a volume of 2.2 maf would increase river velocity by only 0.1 miles per hour. This would produce river velocity that would remain at only one-seventh of its pre-mainstem dam level (Dreher 1998).[19] As explained below, the costs and environmental impacts of providing even an additional 1 maf would be prohibitive.

[19] Karl J. Dreher, "Competing for the Mighty Columbia River—Past, Present and Future: The Role of Interstate Allocation" presented to American Bar Association April 30-May 1, 1998.

b. NMFS' Subyearling Fall Chinook Studies Cannot Be Used To Inform Decisions On The Use Of Snake River Flow Augmentation.

The BiOp relies heavily on NMFS' existing PIT-tag studies of juvenile Snake River fall chinook survival to provide the scientific basis for Snake River flow augmentation actions. Two statements capture NMFS' sense of confidence in its conclusion that flow augmentation increases the survival of Snake River fall chinook.

> NMFS (2000b) concluded highly significant relationships existed between survival from release points in the Snake River to Lower Granite Dam and the factors flow, river temperature, and turbidity for Snake River fall chinook salmon.

BiOp at 6-35.

> Evidence for a survival benefit to fall chinook salmon from flow management is supported by research results. Data sets consistently demonstrated strong relationships between flow and survival, and temperature and survival (NMFS 2000b). . . . the data indicate that benefits of additional flow in the Snake River continue at flows well above those recently observed during a wetter than average hydrologic condition that included the use of stored water to augment flows (but below that observed in 1997 when survival was lower).

BiOp at 6-36.

These statements overlook substantial problems with using the existing NMFS PIT-tag studies to inform these conclusions. Hydrologists and biologists with the University of Idaho, the Idaho Department of Fish and Game and the Idaho Department of Water Resources have examined the studies that NMFS relies on for these statements in a report entitled "Review of Survival, Flow, Temperature, and Migration Data for Hatchery-Raised Subyearling Fall Chinook Above Lower Granite Dam, 1995-1998." The report is enclosed herewith as Exhibit 4 and incorporated herein by this reference.

The report concludes that survival and flow data, despite showing an apparent correlation between flow rates and survival, do not imply a cause-and-effect relationship between flow and survival of subyearling fall chinook and, thus, should not be used as a basis to inform the flow augmentation debate. This is primarily because the experimental design under which these data were collected did not address other factors that appear to exert a strong influence on migration characteristics and survival.

This conclusion rests on four points. First, although flow can be correlated with survival of hatchery-reared fall chinook, there is an equally strong or stronger correlation between estimated survival and release date. NMFS' experimental design assumed that sequential releases of hatchery-reared fall chinook would not influence survival independent of flow, temperature, and turbidity. The high correlation between time of release and survival makes this assumption questionable.

Second, travel times did not correspond to flow rates. For instance, travel times for the early percentile surviving fish (5^{th}, 10^{th}, and 25^{th} percentiles) were *less* at lower flows than at higher flows for most releases. Median travel time for the 5^{th} percentile surviving fish decreased from 33 days to 16 days between the first and the sixth weekly releases, despite a decrease in the 5^{th} percentile flow indices during the same time from 122 kcfs to 63 kcfs. These travel time and arrival patterns were contrary to what would be expected if higher flows resulted in significant improvements in survival.

The fact that travel time is inconsistent with flow rates may result from (1) the migration rate being weakly dependent on flow in the flow ranges considered or (2) other important non-flow factors influencing migration rate. An example of a non-flow factor is "readiness to migrate." NMFS' study used hatchery-raised, subyearling fall chinook as surrogates for wild fish. Implicit in the use of these hatchery-raised subyearlings in sequential weekly releases is that the fish are equally ready to migrate when released. Longer travel times for portions of early-released subyearlings, despite substantially decreasing flows, suggests that the fish in the weekly sequential releases may not have been equally ready to migrate. Differences in states of readiness to migrate would confound the analysis of flow and survival relationships. Correlations of flow and temperature with travel time and survival are only meaningful if the groups of fish studied are actively migrating or relatively similar in their state of readiness to migrate.

Third, flow rates, velocity, temperature, and turbidity are closely related with one another. The current data are insufficient to allow delineation of the effects of these individual attributes of flow. Understanding the effects of individual attributes of flow, particularly the usefulness of flow augmentation to compensate for the effects of reservoir impoundment on these attributes, is fundamental to determining the effectiveness of flow augmentation efforts for increasing survival of subyearling fall chinook salmon.

Fourth, additional problems with existing studies must be addressed prior to making conclusions about the efficacy of flow augmentation. These problems include the use of flow and temperature indices that do not represent overall migration conditions; release timing of hatchery-raised fish that is not representative of natural migration; relatively high post-release mortality; and the inability of reach survival estimates to reflect the full spectrum of potential effects from altered water velocities, temperatures, and turbidities during migration (e.g., altered migration timing, bioenergetics, and transition into the estuary and ocean).

Thus, existing correlations between survival of hatchery-raised subyearling fall chinook salmon with flow rates and water temperatures do not inform whether augmenting mainstem Snake River flows improves subyearling survival. Further research is required on this issue.

c. Upper Snake River Flow Augmentation Does Not Provide Temperature Or Turbidity Benefits.

Among the purported benefits of flow augmentation is reduction of the temperature of the lower Snake River, which during the heat of the summer frequently exceeds 68 degrees, the current water quality standard. The BiOp underscores the importance of temperature issues, citing an identified strong, positive relationships between the survival of subyearling migrants and flow, temperature and turbidity. As explained above, upper Snake River flow augmentation is capable of inducing only small changes in the velocity of water in the salmon migration corridor. Likewise, upper Snake River flow augmentation is not capable of providing the two other characteristics of river flow that NMFS deems biologically relevant – temperature and higher turbidity.

All flow augmentation from the upper Snake River Basin is routed through the Hells Canyon Complex and its major storage project, Brownlee Reservoir. Therefore, analyses of temperature issues must focus on the effects of releases from Brownlee Reservoir that reach the free-flowing portion of the Snake River after flowing through Hells Canyon Dam.

Three factors limit the effectiveness of upper Snake River flow augmentation as a tool for reducing lower Snake River temperatures. First, during the period in which lower Snake River temperature becomes a biological concern, the temperature of the Snake River flowing into Brownlee Reservoir is already too warm to provide any biological benefit. Thus, it does not make sense to attempt to increase inflows to Brownlee Reservoir in order to produce lower temperatures for migrating salmon. Moreover, Brownlee Reservoir itself tends to heat up by the time that lower Snake River water temperatures approach 20 degrees Centigrade and is not significantly cooler than the water in Lower Granite Reservoir. Second, releases from Brownlee Reservoir are mixed with water from other rivers before they reach Lower Granite Reservoir. The Salmon, Imnaha, Grande Ronde, and Clearwater rivers generally exceed the flow of the Snake River below Hells Canyon Dam and dilute any temperature benefits that might be gained from Brownlee releases. Third, and most fundamentally, the temperature of the Snake River as it flows into Lower Granite Reservoir is largely determined by ambient air temperatures. During the heat of the summer, Snake River flows warm up quickly in the river reach between Hells Canyon Dam and Lower Granite Reservoir.

Not only is upper Snake River flow augmentation incapable of mitigating temperature problems in the lower Snake River, it may actually make matters worse. Releases from Brownlee Reservoir may actually increase temperatures in Lower Granite Reservoir.

Concerns regarding the temperature of the lower Snake River during the fall chinook migration are attributable in substantial part to the delayed migration timing of fall chinook juveniles. This later migration timing exposes the smolts to higher summer water temperatures. NMFS should review its water management policies to address this delayed migration problem and restore more natural run timing.

Moreover, upper Snake River flow augmentation involves the release of clear water from Brownlee Reservoir. These releases do not provide higher turbidity, which NMFS postulates provides benefits to migrating fish.

2. Additional Snake River Flow Augmentation Would Cause Severe Economic, Ecological, And Recreational Impacts On The Region.

The requirement that RPAs be economically feasible requires consideration of the biological benefits, as well as the impacts and costs, associated with the measure. In the case of proposals for substantial increases in the volume of flow augmentation from the upper Snake River, the benefits are so small compared to the impacts and costs that these proposals cannot be regarded as being reasonable and prudent.

Additional flow augmentation from the upper Snake River Basin would cause overwhelming economic and social impacts on communities in southern Idaho and the region as a whole. Many of these impacts were enumerated in the Bureau's 1999 study which considered the proposal to commit an additional 1 maf of water from Snake River Bureau reservoirs to flow augmentation.[20] Although Idaho does not necessarily agree with all aspects of the Bureau's study, it illuminates several of the problems inherent with flow augmentation.

The Bureau study examined two different scenarios for delivering a total of 1.427 maf for flow augmentation. Under scenario 1427i, the additional water would be obtained by drawing down reservoirs substantially. Under scenario 1427r, Bureau reservoirs would be maintained near current water levels but water users who have contracted for Bureau storage would suffer serious shortages. Generally, the Bureau found that scenario 1427i would cause less economic impact but greater adverse ecological effects than scenario 1427r and, conversely, that scenario 1427r would have greater economic impact but less impact to resident fish and wildlife and recreation than scenario 1427i. Under either scenario, though, the Bureau concluded, "There is insufficient storage space in the Snake River basin under Reclamation's and the Corps' exclusive control to provide a large amount of water for flow augmentation without significant impacts to natural resources, recreation, and economic sectors" (USBR 1999 at 9-2).

The Bureau noted that severe economic problems would be imposed on agricultural communities under either scenario, especially during an extended period of drought. In an average year, the amount of irrigated farmland taken out of production would range from 243,000 acres (1427i) to 360,000 acres (1427r). In dry years, this estimate would increase to a range between 376,000 acres (1427i) and 643,000 acres (1427r). The decrease in value of production of crops would range from $90 million (1427i/average water year) to $244 million (1427r/dry water year). The annual loss of proprietors' income and other property income would range from $47 million (1427i) to $81 million (1427r). The Bureau study also noted that these "negative economic impacts . . . would filter down to part-time and minorities [sic] farm workers and workers in associated industries." "The people most likely to be affected would be low-income, temporary workers, with few alternative employment opportunities." And, because "Native American and Hispanic communities in the basin rely heavily on the agricultural economies of their communities for their livelihoods," providing additional flow augmentation would be done at the expense of minority communities, thus compromising notions of environmental justice (USBR 1999, Ch. 8).

[20] U.S. Bureau of Reclamation, "Snake River Flow Augmentation Impact Analysis Appendix" (Feb. 1999) (appended to the U.S. Army Corps of Engineers' *Draft Lower Snake River Juvenile Salmon Migration Feasibility Study and Environmental Impact Statement*) ("USBR 1999").

Furthermore, the Bureau found that the "non-agricultural public" would be significantly impacted by the 1 maf provision. Increasing municipal demands for water, which are already facing shortages, would be further impacted by changes in current streamflows and reservoir elevations. The costs of meeting water quality standards with reduced reservoir elevations would be very high. Impacts to fisheries, water quality, bald eagles, and recreation would be particularly severe at Cascade Reservoir, currently the second most popular fishery in the state of Idaho. Listed species such as bull trout in the Boise and Payette Rivers and aquatic snails near C.J. Strike Dam were adversely affected during portions of the year. Recreational use of the Boise River near the city of Boise would decrease by a range of 75 percent (1427i) to 82 percent (1427r). The national economic effects stemming from the loss in recreational value would range from $4 million (1427r) to $14 million (1427i) (USBR 1999, Ch. 9).

Findings of the 1 maf analysis were provided to the Corps in February 1999. Upon examination of the Bureau study, the Corps found that both scenarios presented complex and costly problems for individuals and the region.[21] "[G]reat uncertainty and risk remain due to the difficulty at this level of analysis of specifying where water for augmentation would be obtained, predicting the likelihood of overcoming institutional constraints associated with acquiring that quantity of water, and the high level of predicted economic and social impacts" (Corps 1999 at 5.16-5). Specifically, the Corps concluded, based on the Bureau's analysis:

> "It is not possible to provide a total 1.427 maf without reallocating existing irrigation water rights and/or contract entitlements. If irrigation bears the primary burden for providing a total 1.427 maf (thus protecting water quality, resident fish and wildlife, and recreation), the annual economic impact to the region is estimated to range from $76 to $130 million. Total annual acquisition costs from willing sellers could exceed $80 million.
>
> If irrigation is protected—and instead water quality, resident fish and wildlife, and recreation bear the primary burden for providing 1.427 MAF by maximizing annual reservoir drawdowns—the annual economic impact to the region's irrigation economy is estimated to range from $44 to $95 million. Total annual acquisition costs from willing sellers under this scenario could exceed $57 million" (Corps 1999).

Notably, the Corps expressed concern that "data to assess the biological benefits of additional flow augmentation" had not been developed. Consequently, the Corps concluded that "an alternative could not be formulated in sufficient detail to compare the relative benefits and costs of a 1 maf alternative to the other alternatives developed for this [Environmental Impact Statement]" (Corps 1999, at 5.16-5).

Another, more recent study conducted by Brockway Engineering has considered the hydrologic, economic and social impacts of flow augmentation proposals for the upper Snake

[21] U.S. Army Corps of Engineers' *Draft Lower Snake River Juvenile Salmon Migration Feasibility Study and Environmental Impact Statement* (Dec. 1999) ("Corps 1999").

River Basin.[22] The Brockway study found that the Bureau study underestimated the annual irrigation shortages that would occur given increased flow augmentation. In particular, the Bureau's 1427i scenario's predicted irrigation shortage of 188 kaf was far below Brockway's estimates of 321 to 480 kaf (Brockway 2000 at xxvi). The Brockway study notes, for comparison, that even without flow augmentation, shortages are approximately 70 kaf annually (Id.). For a moderately severe drought year, the Brockway study estimated irrigation shortages of 1137 kaf to 1587 kaf, which are twice as high as the Bureau's 1427i scenario's prediction of 592 kaf and comparable to the 1427r scenario's prediction of 1448.

Given the severity of impacts additional flow augmentation would impose on agricultural communities, municipalities, recreationists, resident fish and wildlife, and water quality, coupled with the uncertainty regarding whether additional flow would contribute significantly to salmon survival, a federal mandate for additional flow augmentation is unjustifiable.

E. Comments On Specific Measures In The BiOp.

1. Water Conservation Improvements (Section 9.6.1.2.6, Page 51).

We appreciate the fact that NMFS has phrased this measure so as to permit the Bureau to negotiate agreements with water users that can provide a mix of benefits to both the water users and to the fish. Successful water conservation programs will require the cooperation and commitment of irrigation districts, which own the canals, laterals, sprinklers and other facilities that would deliver conservation benefits. The Bureau must be permitted the latitude to provide incentives to water users to enter water conservation agreements; this is the only way to ensure their full participation.

Two notes of caution regarding conservation efforts are in order. First, the benefits to salmon and steelhead of such efforts must be carefully analyzed before conservation projects are undertaken. Calculating the streamflow effects of conservation must be far more sophisticated than merely assuming, erroneously, that reducing diversions by one acre-foot will increase lower Snake River flows by a similar amount. Effects of water conservation on return flow patterns must be considered. Second, conservation programs can have a variety of effects on local habitat areas and other water users. These impacts should also be considered before programs proceed.

2. Unauthorized Use Of Bureau-Supplied Irrigation (Section 9.6.1.2.6, Page 51).

NMFS correctly notes that unauthorized use of Bureau-supplied water (water spreading) is not a federal action and hence is not subject to this consultation. Water spreading is appropriately addressed either when contracts with irrigation districts are amended or when they expire.

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[22] Brockway Engineering, P.L.L.C., "Evaluation of Flow Augmentation Proposals on the Snake River above Lower Granite Dam" (Apr. 2000) ("Brockway 2000"). The Brockway study has been submitted to the NMFS administrative record by the Idaho Water Users Association.

In order to understand this issue, it is necessary to understand the nature and origin of water spreading. Water spreading encompasses a broad category of practices that have occurred over the decades since the Bureau projects were first built, the result of which is a disconnect between the amount of acres initially designated as irrigable and included in a contract and the amount of acres actually being irrigated. Thus, it is wrong to assume that all water spreading *per se* contributes to increased use of water.

The right to receive irrigation water from Bureau projects is governed by spaceholder contracts. These contracts govern the percentage of project costs districts are required to pay and the lands within each district that are entitled to receive Bureau project water. To ensure the costs of a project were properly allocated, Congress directed the Bureau to classify lands as irrigable or non-irrigable and to certify that lands identified to receive project water are irrigable. Whether lands are designated as irrigable is based upon the land's ability to produce crops from gravity irrigation. A substantial portion of what is referred to as "water spreading" is attributable changes in irrigation patterns and practices changed, due largely to the introduction of sprinkler irrigation. Often, portions of fields that were not designated as irrigable because they were too high for gravity irrigation, became irrigable with sprinkler irrigation. Some of this land was put under sprinkler irrigation decades ago. It is simply unavoidable that water is applied to these lands because sprinkler systems cannot selectively irrigate only a portion of a field. Sprinklers also made irrigation more efficient, so that the same amount of project water could be used to irrigate more acreage within the same irrigation district without increasing the historic diversion rate.

The Bureau has attempted to respond to the evolving nature of irrigation practices through administrative means. Where it appears Bureau authorization and on-the-ground water use do not match up, the Bureau reviews the classification of project lands as irrigable or non-irrigable and the contracts that have been issued and determines whether reclassification of the lands is appropriate. Under the Bureau's current land classification standards, lands that have become irrigable due to new accessibility or increased efficiency are now eligible for water delivery. NMFS' proposed "zero net impact" standard could be interpreted to prevent the Bureau from updating its land classifications to reflect the actual irrigable status of lands.

We question the application of the "zero net impact" standard to contract actions that address water spreading. Water spreading is a practice that has occurred over several decades and that has, until recently, been at least tacitly encouraged by the federal government. Thus, water spreading is part of the environmental baseline against which impacts to the species are measured; any effects of water spreading were felt decades ago. NMFS has generally applied the "zero net impact" standard to new diversions, not to old ones. The "zero net impact" standard may prevent the Bureau from responding to the historical equities favoring farmers that have raised crops on acreage that has been irrigated for decades. NMFS need not be so rigid as to eliminate this acreage in every instance.

Also, a blanket "zero net impact" standard is not necessary because the impacts of water spreading are vanishingly small. A 1994 Audit of Bureau projects by the Department of the Interior, Office of the Inspector General estimated the number of acres subject to water spreading in the upper Snake River Basin. Although the State of Idaho questions the accuracy of the Audit and believes the amount of water spreading reported in the Audit is overstated, the Audit is useful for illustrating that even the alleged amounts of water spreading have an inconsequential impact on Snake River flows.

Mr. Ondrechen, of the Idaho Department of Water Resources, analyzed the impact of water spreading, as described in the 1994 Audit Report, on Snake River flows.[23] A copy of Mr. Ondrechen's declaration filed in the case of Trout Unlimited v. NMFS, Civ. No. 00-262 MA (D. Or.) is attached hereto as Exhibit 5. The results of this analysis, illustrated in Figure 5, reveal that the impact of the alleged water spreading in the upper Snake River Basin is inconsequential by comparison to Snake River flows measured at Lower Granite Dam. When compared to the 30-year average flows of Lower Granite Dam, see Figure 2, the impact of water spreading on flows is barely apparent. Indeed, since the annual outflow of the Snake River at Lower Granite Dam is approximately 37.8 million acre feet of water, the 85,763 acre feet of water labeled by the 1994 Audit as subject to water spreading is only 0.002, or one-fifth of one percent, of the flow at the dam.

In any event, the notion that water spreading uses water that would otherwise remain instream and that terminating water spreading will *ipso facto* increase river flows to the benefit of listed species is inaccurate. As provided by project authorizations for the upper Snake River projects and spaceholder contracts, a specific portion of each reservoir is allocated to storage of water for irrigation. The Bureau is obligated by section 8 of the 1902 Reclamation Act, spaceholder contracts, and its project water rights to hold water in this space for irrigation purposes. Water spreading involves the use of water taken from that portion of the reservoir already allocated to irrigation; the practice does not increase the uncontracted storage space over which the Bureau has discretion to assign to the water bank for flow augmentation. *See generally*, 1999 BiOp at III-3.

In sum, the BiOp should provide that the Bureau will consult with NMFS on all contract modifications, including those addressing water spreading issues. This will ensure that NMFS can examine the exercise of the Bureau's discretion to ensure the outcome will not harm fish migration conditions. However, NMFS should delete the "zero net impact" standard as unreasonably rigid for the following reasons: (1) the acreage in question has been irrigated for decades and is part of the environmental baseline; (2) much of this acreage is subject to water spreading only because of outdated and incorrect land classifications by the Bureau; and (3) water spreading as a whole has virtually no impact on flows at Lower Granite Dam.

3. Lower Snake River Compensation Plan (Page 9-16, 2nd full paragraph).

The Lower Snake River Compensation Plan ("LSRCP") is identified as an area for off-site mitigation for the Corps of Engineers. This is not appropriate. The LSRCP is a congressionally-authorized program to provide mitigation for the fishery losses caused by the

[23] This analysis assumed solely for illustrative purposes that all the water associated with the acres estimated by the 1994 Audit as subject to water spreading would be put in the river system and dedicated to augmenting streamflows. As discussed below, however, any water "saved" from water spreading acres would not necessarily be transferred to instream flows.

dams. The Corps cannot use the program as a basis for mitigating dam effects at the expense of the congressionally-authorized purposes. The concept of mitigating for the dams by reducing the mitigation for the dams is illogical.

4. Albeni Falls Operations (Section 9.6.1.2.3, Page 9-46).

The BiOp requires the action agencies to draft Albeni Falls every alternate year, from 2000 through 2006, to an elevation of no lower than 2051' for the purpose of meeting chum salmon flow needs during November and December. BiOp at 9-46. This measure appears to represent a compromise between the United States Fish and Wildlife Service ("USFWS") and NMFS, relative to the needs of two listed species, chum salmon below Bonneville and the bull trout population in Lake Pend Oreille.[24]

While the State of Idaho recognizes it is necessary to balance the needs of listed species, actions taken to advance one species should not come at the expense of other species. Kokanee play a key role in developing and maintaining ecological conditions in Lake Pend Oreille, which in turn support the bull trout population. Requiring a four-foot drawdown of Lake Pend Oreille in alternating years may very well contribute to the collapse of the kokanee population in Lake Pend Oreille and, consequently, jeopardize the long-term survival of the bull trout population.

The bull trout population in Lake Pend Oreille likely has been able to coexist with lake trout because, until recently, there has been an abundant supply of kokanee as a forage base for both species (USFWS Draft BiOp at page 31). Historically, management of Lake Pend Oreille at winter pool elevations of 2055' and above provided flood control, power production and a productive fishery. Historic data suggests kokanee benefit from consecutive years of higher winter pool levels. During the winters of 1958, 1959 and 1960, Lake Pend Oreille was held at an elevation of about 2057', 2056' and 2056' respectively. Five years later, in 1963, 1964 and 1965, Lake Pend Oreille supported the highest harvest during the decade, over 1,000,000 fish annually. However, in 1968, the Corps began operating the winter pool level at 2051'. Subsequently, the kokanee population in Lake Pend Oreille began to decline and now is at record low levels and on the verge of collapse.

Based on research conducted by the Idaho Department of Fish and Game, improvement in lakeshore spawning success appears to be the best available option to restore kokanee numbers. IDFG research demonstrates that higher winter pools result in higher kokanee fry survival. Kokanee fry survival rates between egg deposition and fall hydro-acoustic estimates have been made, beginning in 1995 (the eggs were laid during the winter of 1994-95 and fall fry population estimates were made in 1995). In 1995, the fry survival rate was 1.4 percent when the lake was held at a winter pool elevation of 2051'. In 1996, the Corps drew the lake down to 2051', but an exceptionally wet fall caused the lake to rise to 2055' by mid-December. Kokanee fry survival in 1996 was 3.3 percent, showing some benefit with a portion of the shoreline being watered by higher lake levels. The winter of 1996-97 was the first test year of a NPPC-funded study, but it was also the year with the greatest spring flood on record causing the loss of a

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[24] *See* "Questions and Answers about Fish and Wildlife Service Draft Biological Opinion on Effects to Listed Species from Operation of the Federal Columbia River Power System dated July 27, 2000" (stating that term and condition #5 has been coordinated with NMFS recommendations for chum salmon flows below Bonneville Dam.).

substantial portion of the kokanee population. Fry survival in 1997 was estimated at only 1.8 percent. Fry survival in 1998 and 1999 were 9.6 percent and 6.0 percent, respectively, during years when the lake was held at 2055'. These higher survival rates occurred for three and four years after the initial high winter pool level during the winter of 1995-96. IDFG does not yet have fry survival estimates for the winter of 1999-2000, when the lake was held at the compromise level of 2053'.

Research to date indicates that kokanee fry survival is best in gravels containing less than 30 percent fines and at a depth covered by three to four feet of water to avoid scouring by winter storms. Occasional lower winter pool levels may be necessary to re-sort and redistribute shoreline spawning gravels at a depth that will result in higher kokanee survival rates in subsequent years. It is important to note, however, that this hypothesis has not been tested. While we agree that the effects of occasional drawdown should be studied over the long term, there is no scientific evidence available supporting the notion that drafting Lake Pend Oreille to fall/winter levels of elevation 2051' and 2055' in alternating years will benefit kokanee production.

Lower winter pool levels may be necessary to re-sort and redistribute shoreline spawning gravels at a depth that will result in higher kokanee fry survival rates in subsequent years. However, there is both direct and indirect evidence that the duration of the benefit of a 2055 winter lake level is at least three years and possibly more.

Currently, it appears that the need for chum salmon flows below Bonneville Dam are in competition for the same water needed to protect bull trout in Lake Pend Oreille. It is our understanding that the flows for chum salmon spawning are necessary, in part, due to local alterations in habitat that block access to tributary spawning areas. It is not clear, however, that drafting Lake Pend Oreille below 2055' in alternating years would provide any more than a very small incremental biological benefit to chum salmon below Bonneville. The biological effectiveness for chum salmon of a four-foot draw down of Lake Pend Oreille as compared to a winter lake level of 2055' has not been evaluated. In contrast, there is evidence that management of Lake Pend Oreille at winter pool elevations of 2055' and above plays a crucial role in providing productive kokanee spawning habitat and that a strong kokanee population is necessary to maintain a strong and resilient bull trout population.

The State of Idaho believes a possible solution can be found to meet the needs for both fish by utilizing the required flood evacuation of Lake Pend Oreille in a different way. Essentially, flows for chum salmon would be provided by shifting releases from September into late October and November. Lake Pend Oreille could then be managed with higher winter pool levels to enhance kokanee spawning habitat, securing the primary forage for bull trout.

Lake Pend Oreille has approximately 1,042,700 acre feet of usable water between the summer pool elevation of 2062.5' and the low pool elevation of 2051'. The State of Idaho has requested the Corps to maintain the winter pool elevation at 2055' to enhance kokanee spawning habitat. Between 2062.5' and 2055' there is 689 kaf of storage. Between 2055' and 2051' there is 352,000 acre feet of storage. What the State is proposing is to "reshape" the flood control release of 689,000 acre feet of water off the top in order to provide chum salmon flows without sacrificing the Lake Pend Oreille fishery by draining the last 352,000 acre feet from the bottom.

Our understanding is that the Corps' flood control constraints require the lake to be at elevation 2060' by October 30 and 2056' by December 1. Normally, the fall draft begins just after Labor Day weekend and continues into late November. Flood evacuation decisions are controlled by Reservoir Control out of Portland. We have requested the Corps reach the minimum winter pool elevation by November 15 to prevent kokanee redds in shoreline gravels from being dewatered. The Corps has verbally agreed to attempt to reach low pool by November 20, and they have generally done a good job of meeting this request. Drawdown from the flood control elevation of 2056' to 2051' is done primarily to generate hydropower at downstream utilities.

The State of Idaho proposes the level of Lake Pend Oreille be held higher in September, then drafted more quickly in October through mid-November. The Corps would need to release about 11,000 cfs above and beyond inflow to accommodate a compressed water release. Flows would need to be less than 27,400 cfs to prevent spill at Box Canyon Dam, the first dam downstream of Albeni Falls on the Pend Oreille River. (Albeni Falls Dam has a similar turbine capacity to Box Canyon). There is enough hydraulic flexibility in the system to accommodate this change, although there might be changes in the revenue utilities generate with this water.

It is our understanding the chum flow request is for 125 kcfs below Bonneville Dam from November 1 through December 31. Modeling by BPA indicates that these types of flows in November will only be met 10 out of 50 years. By December, flows generally increase due to wet weather. Obviously, any water that is provided by Lake Pend Oreille can only supplement the chum salmon flow request until late November, due to IDFG’s agreement with the Corps to not dewater kokanee redds. Supplemental water for late November and December, if needed, would have to come from some other source.

The State of Idaho strongly urges NMFS and USFWS to seriously consider these recommendations. Recent research and historic data indicate that sustained higher winter pool levels are necessary to prevent the complete collapse of the kokanee population in Lake Pend Oreille. Therefore, the BiOp terms and conditions should require, at a minimum, a winter lake level of 2055 or higher for three consecutive years, preceded or followed by a drawdown year. This protocol allows for evaluation of the effect of different management regimes, without contributing to the collapse of the kokanee population and without jeopardizing the primary forage base for bull trout in Lake Pend Oreille. The BiOp terms and conditions should utilize the flood control draft of Lake Pend Oreille to benefit chum spawning habitat below Bonneville.

5. Corps Flood Control Operations (Page 9-55).

The State of Idaho strongly endorses the BiOp’s call on the Corps to “develop and conduct a detailed feasibility analysis of modifying current system flood control operations to benefit the Columbia River ecosystem, including salmon.” The State reads this measure as not pushing the Corps to become reckless in its flood management operations. Nevertheless, current flood management for the FCRPS projects has not been comprehensively reviewed in recent years. Even small shifts in flood control operations could produce significant volumes of water relative to what can be readily secured from other sources. The regional salmon recovery effort has shifted priorities of virtually every aspect of water management at federal projects. The region is now spending tremendous resources in the effort to augment flows during the salmon migrations. The benefits and costs of flood control should be evaluated in light of the expense of other salmon recovery efforts. We encourage the Corps and NMFS to give this item a high priority.

6. Measures To Evaluate And Adjust The Amount Of Water Available To Support Flow Objectives (Section 9.6.1.2.6, Page 9-50).

As discussed in these comments on Chapter 6, NMFS has mischaracterized the effects of the upper Snake River Bureau projects in Idaho. A proper analysis of these projects demonstrates that they have had little or no impact on the listed species and, in fact, have benefited summer flows in the lower Snake River during the summer migration period. Thus, NMFS erroneously concluded these projects pose jeopardy to the listed species and inappropriately seeks the continuation of the current 427 kaf flow augmentation program as an RPA for the Bureau projects.

Aside from the State of Idaho's objection to inclusion of this action as an RPA, the State agrees with NMFS and the Bureau that any flow augmentation with contracted storage space must be from willing lessors in accordance with Idaho water law. The ESA "directs agencies to 'utilize their authorities' to carry out the ESA's objectives; it does not expand the powers conferred on an agency by its enabling act." Platte River Whooping Crane Critical Habitat Maintenance Trust v. FERC, 962 F.2d 27, 34 (D.C. Cir. 1992); Sierra Club v. Babbitt, 65 F.3d 1502, 1510 (9th Cir. 1995). Since the Bureau has no discretion over the use of water accruing to contracted storage space behind upper Snake River Bureau projects, it has no authority to require the release of storage water from contracted space for flow augmentation absent the consent of spaceholders.

Most of the upper Snake River Bureau storage "was conveyed under spaceholder repayment contracts, where Reclamation sold each contractor a share of the reservoir space." RPA at 16, 1995 Hydro Admin. Record (BOR) 589, attached hereto as Exhibit 6. "These contracts are not subject to renewal" and are perpetual in duration. Under the spaceholder contracts, spaceholders are entitled to retain water not used during one year for use in future years.

"The use of spaceholder contracts differs from the way water is marketed on most Reclamation projects." On most Reclamation Projects, a water user enters into a water supply contract for a specified quantity of water or "stating that the contractor's water needs will be met." Spaceholder contracts, on the other hand, convey to the contractor a beneficial interest in specific reservoir space and an entitlement to water accruing to that space. Moreover, water service contracts are typically for a period of years as opposed to the perpetual right conveyed under spaceholder contracts. *See* Exhibit 6.

Since spaceholders receive an unconditional right to water accruing to their storage space, the Bureau has no discretionary authority to release water from contracted space. The ESA does not expand the authority of an action agency and, therefore, NMFS has no authority under the ESA to mandate that the Bureau release water from contracted space. Moreover, the Bureau's existing project authorizations do not "expressly contemplate the acquisition or reacquisition of water supplies for flow augmentation." *See* Exhibit 6. Therefore, the Bureau has no authority to acquire contracted space.

In addition to the absence of legal authority to acquire contracted space, the Bureau may only release water from its storage projects in accordance with state water law. Since none of the Bureau's state water right licenses and permits include flow augmentation as an authorized purpose of use, the Bureau may only rent storage water for flow augmentation pursuant to Idaho Code § 42-1763B. Idaho state law provides no authorization for the Bureau to commit to releasing water in "powerhead space" for flow augmentation.

7. Negotiations With Stakeholders In Idaho To Increase Water Available For Flow Augmentation (Section 9.6.1.2.6; Page 9-53).

The State of Idaho objects to this proposed action on the same grounds it objects to the inclusion of the action requiring continuation of the 427 kaf flow augmentation from the upper Snake River Bureau projects set forth as an RPA measure.

The State of Idaho emphasizes that these comments are directed at the propriety of requiring flow augmentation from upper Snake River Bureau projects under the ESA. The State remains committed to good faith negotiations of water rights issues with stakeholders as part of the Snake River Basin Adjudication. These negotiations provide the most effective means for addressing the federal agencies' flow augmentation objectives because all stakeholders are involved. Absent agreement among all stakeholders, valuable time will be lost while institutional considerations affecting the Bureau's access to such water are resolved. Moreover, negotiations provide a more efficient means for providing flow augmentation. Because the Upper Snake River Bureau reservoir system does not reliably fill every year, participation in the state water bank allows the most effective use of the available storage space by obtaining assurances from the water users of water for flow augmentation based upon the yield of the entire system. This avoids the necessity of holding reservoir storage space as a hedge against dry years.

8. Habitat Actions (Section 9.6.2, Page 9-110).

As explained above, while the State of Idaho agrees that it is within the purview of NMFS to consider expected benefits from non-FCRPS related activities in the FCRPS biological opinion, NMFS has no authority to extend its jurisdiction or that of any action agency over activities unrelated to the FCRPS. The State is concerned that the proposed habitat measures step over the line of permissible consideration of related activities and attempts to expand the role of BPA and the Bureau into areas of traditional state authority.

The State of Idaho strongly objects to the action requiring BPA to experiment with innovative ways to increase tributary flows through establishment of a water brokerage demonstration project. Allocation and regulation of water is a traditional state function. Because water is a common resource, the State must carefully allocate this scarce resource among the many competing uses. Aside from the serious question of whether BPA has legal authority to undertake such a program, NMFS has no basis to direct a federal agency to usurp Idaho's sovereign authority over its water resources. The State of Idaho has established several mechanisms under state law to balance the need for water for fish and wildlife and consumptive water uses. These mechanisms should be used to address tributary water concerns rather than mandating the creation of a federal water brokerage project.

Finally, the State is also concerned about the scope of ESA coverage if these proposed habitat actions are included in the BiOp. While the incidental take statement would provide ESA coverage for the action agencies, it provides no ESA coverage for landowners and water users who agree to cooperate with the action agencies in implementing the habitat measures. NMFS must provide ESA coverage for landowners and water users; otherwise there is no incentive for them to cooperate with the federal agencies.

PART II: COMMENTS REGARDING JEOPARDY ANALYSIS AND BIOLOGICAL REQUIREMENTS OF LISTED SPECIES

I. Introduction

These comments were prepared by the Idaho Department of Fish and Game ("IDFG") and are part of a comprehensive response by the State of Idaho to NMFS and the Federal Caucus on the draft documents. The IDFG comments reflect concerns regarding the scientific underpinnings of the BiOp and Recovery Strategy, within the context of Snake River issues. Since the scientific basis is similar for both federal documents, these comments on the BiOp also apply to the Recovery Strategy. Our intent is not to advocate specific management actions, but to help ensure the best possible science provides the analytical basis of the BiOp and Recovery Strategy. The selection of recovery actions is a policy decision made in the context of biological and non-biological considerations. The role of IDFG is to help strengthen the scientific foundation from which various management alternatives are considered, and assess these alternatives from a biological and scientific basis.

IDFG has identified several key deficiencies in the analyses used for the BiOp. First, the characterizations of extinction risk, stock productivity, jeopardy standard and conservation opportunities are based on optimistic assumptions and generally ignore more conservative assumptions. Second, the conservation burden of the hydrosystem is discounted based on optimistic assumptions that ignore the weight of evidence regarding delayed and "extra" mortality attributable to the hydrosystem; third, the conservation burden discounted from the hydrosystem is shifted to other sectors without clear justification or analysis of the weight of evidence to support this shift; fourth, specific RPA measures, and the biological feasibility of these measures to avoid jeopardy, are not identified; fifth, the performance standards and measures are inadequate to assess the effectiveness of RPA measures; and sixth, a contingency RPA is not identified or evaluated in case performance standards are not met.

In general, the structure of the BiOp and Recovery Strategy is adequate to frame the scientific information. The problem is that the underlying scientific information used in the documents has several fundamental errors and omissions. These errors and omissions alter the conclusions, accentuate uncertainty beyond the limits of scientific objectivity, and result in a misleading depiction of the fundamental choices that face the region if salmon recovery is to succeed. The technical information currently available is adequate to address our technical concerns with the 2000 BiOp and Recovery Strategy. These concerns should be addressed through full collaboration with state and tribal fisheries scientists, which has been lacking during the past two years. If the errors and omissions are corrected, we believe the documents can accurately represent the biological component of recovery options, which policy makers can consider along with important social and economic information in determining recovery actions.

II. Collaboration

The BiOp and Recovery Strategy are federal products developed without full collaboration with state and tribal fisheries scientists. The Cumulative Risk Initiative (CRI).[25] provides much of the scientific basis for the BiOp and Recovery Strategy. Yet, CRI was not developed through collaboration with state and tribal fisheries scientists. As a consequence, the CRI analyses contain many scientific errors and omissions, which result in NMFS reaching misleading conclusions in the BiOp. Although the ramifications of these errors and omissions are significant, they can be easily corrected for the final federal documents through scientific collaboration.

Despite considerable effort by states and tribes to insert their concerns and analyses into the federal process, their concerns have been largely ignored.[26] When corrections have been made, it often seems adjustments are made in other standards or analyses to compensate so general conclusions remain the same. For example, NMFS made some necessary corrections to the rate of population growth that accelerated projected declines,[27] but then NMFS lowered the survival standard,[28] resulting in little change to extinction risk and the amount of improvement needed to avoid jeopardy. We have been encouraged by attempts of some NMFS scientists to establish more collaboration with our scientists, but opportunities remain sparse. To add to this difficulty, new analyses by NMFS relating to the 2000 BiOp have come out in the middle and end of this comment period (Toole 2000; CRI 2000). Our comments on new NMFS analyses are in the Recent Developments section at the end of this document.

NMFS embraced full collaboration in PATH[29] as mandated in the 1995 FCRPS BiOp. As PATH conclusions began to clarify the science, however, NMFS suddenly and unilaterally began an alternative scientific process called CRI. PATH was phased out. Although the CRI analyses are non-collaborative, preliminary, and not fully analyzed or peer reviewed, CRI results became equal, if not greater, partners with PATH in defining the science in the Anadromous Fish Appendix of the Corps' Draft Environmental Impact Statement and the Federal Caucus' Draft All-H Paper. This pattern continues in the latest BiOp and Recovery Strategy, which further marginalize PATH results.

Although the PATH and CRI analyses reach similar conclusions on several key points, there are also several key differences. These differences accentuate the need for continuing a

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[25] The CRI is an analytical process established by NMFS in 1999 and comprised of NMFS scientists. The primary purpose of CRI is to analyze extinction risks and conservation opportunities for listed salmon and steelhead in the Columbia River Basin.

[26] For example, Appendix B and C of these comments and Attachments A and B of IDFG comments on NMFS' A-Fish Appendix describe some concerns and NMFS' response (IDFG 2000b).

[27] For example, NMFS added data from recent years and corrected an algebraic error relating to generational population growth rates (Appendix C).

[28] For example, NMFS shifted their extinction threshold from one fish in any given year, to one fish or less for an entire generational cycle, and selected the less conservative definition of high risk as 5 percent probability of hitting the extinction threshold, rather than their previous alternative of 1 percent probability, (Appendix C).

[29] The Plan For Analyzing and Testing Hypotheses (PATH) is a collaborative analytical process established by NMFS in 1995 and comprised of state, tribal, federal, and non-governmental scientists. The purpose of PATH was to help sort out conflicting scientific hypotheses regarding Snake River salmon and steelhead recovery issues, particularly in the context of long-term management alternatives associated with the FCRPS specified in the 1995 and 1998 FCRPS BiOps.

collaborative process to help identify and frame the differences and help promote a convergence of the science where possible.

IDFG does not want to leave the impression that CRI is not constructive toward resolving conservation and recovery issues. The intent and general framework of CRI is to estimate extinction risks and identify and allocate opportunities for conservation. This is necessary for recovery discussions and decisions. Some of the CRI focus is in areas PATH did not focus, and thus brings new information for consideration. Other areas overlap, and provide an opportunity to corroborate results from the different scientific approaches. However, for this effort to be constructive, the CRI analyses must be based on the best available information and incorporate state, tribal and independent expertise in helping resolve scientific disputes and uncertainties.

There is no reason that recovery decisions must be delayed while the science is sorted out. Because the possible errors and omissions in the CRI analyses can be addressed easily and quickly through collaboration.

III. Scientific Objectivity

In general, the BiOp and Recovery Strategy select the most optimistic (i.e., least conservative) assumptions regarding extinction risk, lack of hydrosystem impacts, and the benefits of improving habitat and hatcheries (e.g., Table 1; Appendix A; and ODFW 2000). A similar tendency was identified in Idaho Dep't of Fish and Game v. Nat'l Marine Fisheries Service, 850 F. Supp. 886 (D. Or. 1994) ("IDFG v. NMFS"). Accentuating non-conservative assumptions and ignoring conservative assumptions, in spite of scientific evidence to the contrary, is not scientifically justified.

NMFS usually selected non-conservative assumptions for factors affecting the amount of survival improvements needed to avoid jeopardy. NMFS selected the optimistic assumption that small, threatened populations face no threat of an extinction vortex, in spite of theoretical and empirical evidence to the contrary (Dennis 1991; BRWG 1994; Botsford 1997). NMFS also selected optimistic assumptions for their extinction and survival standard, recovery standard, FCRPS hydrosystem performance standard, definition of high risk, hatchery effectiveness, years for time series, and effect of fish density on population growth rates (Table 1).

NMFS also typically selected optimistic assumptions for factors affecting the amount of survival improvements attributed to existing and proposed measures in the 2000 BiOp. For example, NMFS selected the most optimistic assumptions to attribute estimated survival improvements of juvenile migrants since the 1995 BiOp to improvements made to the hydrosystem, rather than balance this assumption with the possibility that model differences or high natural flow and spill from good water years could also account for these increases. NMFS also assumed there is no delayed mortality associated with juveniles migrating inriver through the FCRPS, in spite of a wealth of information to the contrary (Marmorek et al. 1996; IDFG 1998, 1999, 2000a, 2000b; Marmorek and Peters 1998; SRP 1998; Bouwes et al. 1999; Congleton et al. 1999; Schaller et al. 1999; NMFS 2000a) and no NMFS data or analyses confirming their assumption.

The effect of NMFS accentuating non-conservative assumptions, regardless of scientific information questioning these assumptions, results in several fundamental errors in the BiOp and Recovery Strategy: 1) underestimation of the actual extinction risk and overestimation of the probability of survival and recovery; 2) underestimation of the survival improvements necessary to avoid jeopardy and ensure survival and recovery of listed Snake River salmon and steelhead; and 3) overestimation of the ability of 2000 BiOp measures to provide necessary survival improvements.

The collaborative decision analysis approach adopted by PATH incorporated the full spectrum of assumptions, uncertainties and weight of evidence in order to more objectively characterize risks and conservation opportunities (Marmorek and Peters 1998; Marmorek et al. 1998; Peters et al. 1999).

The 2000 BiOp and Recovery Strategy should present a more objective characterization of PATH results as a decision-analysis tool, across the full range of scientific debate and uncertainty. There is much evidence in PATH, NMFS' draft Anadromous Fish Appendix, NMFS' white papers on fish passage and smolt transportation, and the ESA record as a whole (e.g., see ODFW 2000, section 3.3.1.2) that the hydrosystem is a source of both direct and delayed mortality of transported and in-river juvenile migrants (NMFS 2000a.). In the BiOp and Recovery Strategy, NMFS presents an unbalanced view of sources of extra mortality, emphasizing uncertainty for one of the listed populations (spring/summer chinook). All Snake River anadromous salmonids are threatened or endangered or extinct (coho), and have hydropower impacts in common. Alternative, non-hydro explanations of extra mortality posited by NMFS in the federal documents should explain recruitment patterns for the entire suite of Snake River anadromous salmonids, but they do not.

Full disclosure of the weight of scientific evidence for key alternative hypotheses, across species lines, should be presented in the final 2000 BiOp and Recovery Strategy. This should not exclude the PATH Weight of Evidence process and the Scientific Review Panel weighted analysis.

IV. Objective Risk Assessment

Risk assessment is critical to ESA decision-making processes. There will always be ecological and scientific uncertainty. The key to objective risk assessment is determining how to best meet the biological needs of the fish in the face of these uncertainties. There should be a clear recognition that lack of a decision, or delay, is actually a conscious decision that the uncertainties are too great to act on, and that the listed populations can survive the delay and still retain enough inherent productivity and diversity to remain poised for recovery. To moderate the risk, this approach should be coupled with aggressive actions in other areas that can be agreed on, recognizing the greatest uncertainty may actually be whether stocks can persist until all the questions are answered.

Based on observed survival patterns of wild Snake River salmon and steelhead, the amount of time available for decision makers to continue trying to sort out recovery options is largely dependent on the weather and the ocean. Available data indicate Snake River spring/summer chinook salmon can maintain current population levels, or even rebuild somewhat, when there are above average runoff conditions (e.g., high natural flow and uncontrolled spill) coupled with average or better ocean conditions (e.g., cool temperature and strong coastal upwelling) (Figures 1 and 2). These favorable conditions also tend to narrow the wide gap in productivity between upriver and downriver indicator stocks (Figure 3). The same data indicate Snake River salmon can decline precipitously when runoff or ocean conditions are poor. The overall trend for salmon across the range of environmental conditions is downward. These environmental factors appear to influence adult returns and survival rates far more than any suite of management actions taken in recent years.

Improved adult returns this year and projected for next year are largely the result of good runoff and ocean conditions. As long as these environmental conditions remain above average, Snake River salmon populations will likely persist or even rebuild slightly; allowing society some additional time to debate and experiment with management options. Conversely, if these environmental conditions do not remain above average (or potentially good runoff conditions are dampened by FCRPS operations[30]), then Snake River salmon populations will likely decline; making any additional delay risky for conservation and recovery of these fish. Basing recovery decisions on an expectation of above average environmental conditions is not a risk-averse approach to species conservation.

If additional aggressive actions to address the mainstem FCRPS are delayed, IDFG recommends linking this decision to prevailing environmental conditions, particularly snowpack, runoff, mainstem water temperature, and ocean temperature and upwelling. If these conditions deteriorate from what was observed for juveniles migrating during 1997-1999, then the FCRPS configuration decision should be revisited immediately and additional interim emergency actions taken in other sectors. These emergency actions should focus on measures with immediate and direct benefits to the fish, such as removing avian piscivores from the estuary and lower river, reducing pinniped predation, altering flood control operations to help maintain high springtime flows, increased mainstem spill, and additional harvest constraints.

Recent and future changes in fish survival and abundance should not be credited to management actions without first factoring out the influence of natural runoff and ocean conditions. For example, if new management actions are implemented which are actually beneficial, but environmental conditions deteriorate relative to the baseline, then it may appear these factors are not beneficial when in fact they may have eased the impact of these deteriorated environmental conditions. Conversely, if management actions are credited for an upswing in survival and abundance, which are actually the result of improved environmental conditions, then a false sense of security can result in further delay and elevated risk when environmental conditions deteriorate.

The history of debate on Snake River salmon recovery actually demonstrates this risk. Snake River salmon and steelhead declined precipitously in the late 1970s. ESA listing was avoided in 1980 when the Northwest Power Planning Act ushered in a new period of

[30] In 1999 and 2000, above average and average snowpack should have provided good spring runoff conditions, but inflexible FCRPS flood control operations coupled with cool or hot spring weather resulted in reduced flow and spill at critical times during the spring migration period (TMT minutes, 1999 and 2000; FPC 2000).

management planning and action. Good outmigration conditions in 1982-84 from high natural flow and spill at mainstem dams apparently resulted in an upturn in salmon survival and adult returns in the mid 1980s (Figure 1). At the time, this upturn was often equated with management actions (e.g., Raymond 1988). Environmental conditions shifted in the late 1980s and early 1990s, demonstrating that Snake River salmon and steelhead had not actually turned the corner toward recovery from the management actions.

There is risk of repeating this error again. Environmental conditions were once again above average during the late 1990s, resulting in an upturn in fish survival and abundance at the turn of the century. The BiOp credits much of this upturn to actions implemented with the 1995 and 1998 BiOps (BiOp, pages 6-75 and 6-76, Tables 6.3-1 and 6.3-2). In the BiOp, fish survival during the next five, eight and ten years will be used to determine if the RPA is successful or whether the breach alternative must be recommended. It is vital that the relative influence of environmental factors, such as above or below average natural runoff and ocean conditions, are factored out in the decision process. If decisions whether or not to breach are simply made based on annual population growth rates over a set number of years, then the breach decision is likely to pivot on ambient snowpack and ocean conditions.

Another important aspect of risk assessment is determining the biological consequences of being wrong. This assessment requires determining which actions are likely to have the most positive biological response even if decisions are made based on false assumptions. This assessment helps determine the most risk-averse alternatives and should be included in the final 2000 BiOp.

IDFG believes objective risk assessment in the final 2000 BiOp and Recovery Strategy will demonstrate:

- Snake River ESUs are imperiled, particularly at the population level; providing recovery requires a substantial improvement (e.g., three-fold change for Snake River spring/summer chinook) in overall life cycle survival;

- The most risk-averse actions, for all species and runs (recognizing the full range of scientific debate and uncertainty) must address direct and delayed effects of the FCRPS, coupled with immediate actions regarding harvest, predation, early ocean and estuary survival and degraded tributary habitat; and

- Resolution of uncertainty adequate to change these conclusions is unlikely to be gained through an additional five or ten years of research.

The importance of the 2000 BiOp and Recovery Strategy to long-term recovery decisions accentuates the need for objective risk assessment. This is why a more collaborative approach should be embraced prior to completion of the 2000 BiOp, Recovery Strategy and Corps Lower Snake River Feasibility Study/EIS.

V. Scientific Approach for Assessing Jeopardy and Conservation Actions

There are several important scientific steps that must be taken to determine biologically defensible recovery strategies:

Step 1: **Determine extinction risk and survival and recovery standards for jeopardy;**

Step 2: **Determine the amount of survival improvements needed to avoid extinction and meet survival and recovery standards;**

Step 3: **Determine fish mortality and allocate among life stages;**

Step 4: **Determine the amount of discretionary[31] mortality above the natural baseline;**

Step 5: **Assess management opportunities to address this discretionary mortality;**

Step 6: **Select a suite of management actions that are likely to provide the necessary survival improvements; and**

Step 7: **Develop an aggressive monitoring and evaluation plan to assess effectiveness within the context of environmental variability.**

None of these steps can be avoided.

As mentioned earlier, the general structure of the BiOp and Recovery Strategy is adequate to frame the necessary scientific information. The problem is that the scientific information used in these steps has several fundamental errors and omissions, and some steps, such as determination of discretionary mortality and ability of management actions to address this mortality (i.e., biological feasibility), were not included in the NMFS analysis.

Step 1: Determine extinction risk and survival and recovery standards for jeopardy.

NMFS used optimistic assumptions to evaluate extinction risk and lowered the standards used for jeopardy relative to the 1995 and 1998 FCRPS BiOps. The effect of these errors is underestimation of actual extinction risk and reduction in the amount of survival improvements necessary to avoid jeopardy. To correct these errors, NMFS must include a more realistic range of assumptions regarding extinction threshold, depensation, definition of high risk, hatchery effectiveness and density dependence (Table 1).

NMFS should also adhere to the survival and recovery standards developed collaboratively as a result of <u>IDFG v. NMFS</u> (BRWG 1994; Marmorek et al. 1998) and the

[31] Discretionary mortality is the mortality beyond the natural baseline that can potentially be managed. Most discretionary mortality is anthropogenic, although some factors, such as avian and pinniped predation, are also partially linked to natural ecosystem processes.

jeopardy standards established in the 1995 and 1998 FCRPS BiOps (NMFS 1995, 1998). NMFS apparently has shifted from a focus on recovery, to trying to avoid absolute extinction. The 2000 BiOp should develop a clear "crosswalk" linking the earlier jeopardy standard developed collaboratively to the standard currently proposed by NMFS. IDFG remains concerned that even the 1995 BiOp standard is not conservative enough.

For example, NMFS defined a "moderate to high probability of recovery" as only a 50:50 chance that the standard would be achieved within 48 years (NMFS 1995; 2000b). The *IDFG v. NMFS* collaborative process recommended 24 and 48 year recovery standards (BRWG 1994), but NMFS selected a standard for only the 48-year period (NMFS 1995). NMFS now states: "It may be unrealistic to expect populations to return to recovery abundance levels within this time period [48 years]," and therefore introduced a 100 year standard (BiOp, page 1-12). The reasons for shifting from the earlier standard should be justified in the 2000 BiOp.

Step 2: Determine the amount of survival improvements needed to avoid extinction and meet survival and recovery standards.

The problems identified in Step 1 carry over into Step 2. NMFS' use of optimistic assumptions regarding extinction risk, lowering of the jeopardy standard, and assumption that populations can grow exponentially result in the perception of less difference between the current productivity of the fish and the productivity necessary to avoid extinction and provide recovery. This narrowing of the gap by NMFS is not scientifically supportable.

The BiOp concludes that approximately a 30% improvement in lifecycle survival of Snake River spring/summer chinook avoids jeopardy (Tables 1, 2 and 3 in Appendix A; BiOp Tables 9.7-6, 9.7-10, 9.7-12). Because the CRI approach includes such optimistic assumptions (Table 1), this estimate is far lower than estimates for recovery that include a more realistic range of assumptions (IDFG 2000a, 2000b; Peters and Marmorek 2000). These assessments indicate a 170% or more improvement in lifecycle survival is needed for recovery of Snake River spring/summer chinook.

Step 3: Determine fish mortality and allocate among life stages.

The CRI analysis used in the BiOp and Recovery Strategy does address the concern expressed by IDFG and other Salmon Managers regarding allocation of overall lifecycle mortality of Snake River spring/summer chinook salmon (IDFG 2000a, 2000b; STUFA 2000). CRI now uses empirically derived estimates of smolt-to-adult survival to solve for egg-to-smolt survival, similar to the approach recommended by the Salmon Managers. Mortality allocation issues related to delayed hydrosystem mortality (smolt-to-adult) were not resolved in the CRI analysis and are discussed in Step 4 below.

Step 4: Determine the amount of discretionary mortality above the natural baseline.

NMFS failed to determine the amount of discretionary mortality for each life stage above the natural baseline. This step is crucial in developing recovery strategies because it allows decision makers to focus actions on the primary limiting factors that can be managed. The majority of mortality in the lifecycle of salmon and steelhead is natural mortality that has little chance of being improved by man. Effective recovery strategies will focus on the discretionary mortality beyond this natural baseline, which is usually the result of anthropogenic factors.

Available data indicate relatively little discretionary mortality of Snake River salmon and steelhead during the egg-to-smolt stage, and relatively large discretionary mortality during the smolt-to-adult stage (Figure 4). Potential survival improvements from addressing the discretionary mortality in the egg-to-smolt stage (i.e., spawning and rearing habitat) range from 0-34% for seven indicator populations (median 6%) (Marmorek et al. 1998; IDFG 2000a). Estimated potential survival improvements from addressing discretionary mortality during the smolt-to-adult stage is over 200%, based on survival trends of comparable upriver and downriver stocks (Figures 3 and 4) (Marmorek and Peters 1998; IDFG 2000a, 2000b; STUFA 2000).

The BiOp and Recovery Strategy imply much of this mortality in the smolt-to-adult life stage is not discretionary because smolt transportation has largely fixed the dams and NMFS assumes no delayed mortality of fish migrating inriver when evaluating their jeopardy standard for the RPA (e.g., BiOp p. 9-12). NMFS assumes the extra mortality must be associated with non-discretionary ocean conditions, discretionary estuary conditions (e.g., estuary habitat and predators), and delayed effects of discretionary conditions during the egg-to-smolt stage (e.g., hatcheries and spawning and rearing habitat). Although the potential sources of discretionary mortality in the estuary (e.g., avian and pinniped predators) should be addressed, NMFS' assessment is not based on the weight of scientific evidence.

NMFS concurs that the level of delayed or "extra" mortality associated with the fishes' hydrosystem experience is pivotal to survival and recovery decisions for the Snake River ESUs (NMFS 1995, 1998, 1999, 2000b). Given the importance of this issue, NMFS should have devoted much of the BiOp and Recovery Strategy to a thorough assessment of the weight of scientific evidence supporting or not supporting this source of mortality. NMFS failed to take this approach and instead accentuated uncertainty and recommended more study (BiOp at 9-4, 9-11, 9-13, 9-14, 9-18, 9-19, Figure 9.4-1).

The final 2000 BiOp and Recovery Strategy should include full disclosure of compelling scientific evidence for substantial delayed effects of the hydrosystem experience. This evidence includes:

- Continued downward trend of adult returns and survival for *all* species and runs of wild Snake River salmon and steelhead since completion of the FCRPS (Figure 5);

- An average 67% additional mortality (and thus potential 200% survival improvement) for upriver spring/summer chinook stocks relative to their downriver counterparts since completion of the FCRPS, and synchronous common-year effect of mortality factors experienced by both upriver and downriver stocks (e.g., additional lower Columbia River dams, estuary and early ocean conditions, disease (except as related to smolt transportation), harvest, hatcheries (except as related to smolt transportation), lower river and estuary predators, and climate) (Figure 3);

- Less disparity between survival of comparable upriver and downriver indicator stocks when outmigration conditions are more favorable (e.g., high natural runoff and spill) (Figures 1 and 3);

- Elevated post-Bonneville mortality of transported fish relative to uncollected inriver juvenile migrants (Bouwes et al. 1999), with preliminary data indicating this trend continues for adult returns in 1999 and 2000[32];

- Elevated post-Bonneville mortality of transported fish relative to inriver migrants based on current collection and transportation operations ('D'-value well below one) (Bouwes et al. 1999; BiOp Table 6.2-8);

- Transport and control ratios (T:C) that do not demonstrate a transport benefit relative to "true" inriver migrants passing dams via the spillway or turbines (Bouwes et al. 1999; see previous footnote);

- Contrasting reservoir-reach and smolt-to-adult survival patterns based on number of collections (i.e., PIT tag detections) at dams (Figure 6);

- Different survival of fish relative to transport location (Figure 6); and,

- The preponderance of scientific evidence demonstrating adverse direct and indirect consequences of exposing plant and animal species to anthropogenic factors completely outside of their evolutionary history.

The above points are discussed in more detail in prior IDFG comments (IDFG 2000a, 2000b).

The final 2000 BiOp and Recovery Strategy should also explicitly incorporate previous assessments of the weight of scientific evidence associated with various models and assumptions relating to FCRPS and non-FCRPS sources of mortality (IDFG 1998, 1999, 2000a, 2000b; Marmorek and Peters 1998; SRP 1998).

The BiOp and Recovery Strategy also fail to provide a thorough assessment of the weight of scientific evidence indicating other factors, not related to the hydrosystem, are primarily responsible for masking benefits of smolt transportation and other FCRPS measures, particularly within the context of the evidence described above. This line of reasoning and weight of evidence must be able to rationally address the full biological picture observed in the region.

The BiOp and Recovery Strategy should clearly describe the assumptions that must be true in order to conclude that current operations (e.g., smolt transportation, flow augmentation,

[32] Preliminary IDFG analysis of wild Snake River spring/summer chinook PIT tag data for 1997 and 1998 smolt outmigrations indicate: 1) smolt-to-adult return rates (SAR) of transported smolts were less than SARs for uncollected smolts migrating inriver; 2) 'D'-values, based on NMFS' reservoir-reach survival estimates (BiOp, Appendix B, p. B-21), were less than 0.5 when comparing post-Bonneville SARs for transported smolts and uncollected smolts migrating inriver.

spill, etc.) have successfully compensated for the adverse effects of the FCRPS. NMFS should then describe the weight of scientific evidence and theory for and against these assumptions.

For smolt transportation to provide survival benefits to offset the FCRPS-related direct and delayed mortality, the following assumptions must be true: 1) "extra" mortality apparent for upriver stocks (for all species and runs) originated about the same time the FCRPS was completed, but is not related to the dams; 2) this extra mortality occurs in the estuary and ocean but is selective for Snake River fish (while excluding downriver stocks) and is not related to delayed effects of the dams or smolt collection and transport; 3) upriver stocks (including Snake River) go to "worse" spots in the ocean than downriver stocks (particularly after poor outmigration conditions evidenced by low mainstem flow and spill), but this behavior began only after completion of the FSRPS and is unrelated to the hydrosystem experience; 4) upriver stocks do not go to "worse" spots in the ocean when outmigration conditions are associated with high natural runoff and spill; 5) if ocean conditions are not the cause of "extra" mortality, then elevated disease and/or poorer genetics and less productive freshwater habitat accounts for this mortality, but it is not expressed until fish arrive at the estuary or ocean, is not related to the hydrosystem experience, and is apparent only in upriver stocks; and 6) extra or delayed mortality of Snake River stocks is not substantially higher for fish transported than those that migrated in-river *and* the delayed mortality of both groups is unrelated to the hydrosystem experience.

The weight of scientific evidence supporting this narrow set of assumptions is low (IDFG 1998, 1999, 2000a, 2000b; Marmorek and Peters 1998; SRP 1998). If NMFS chooses to accentuate this narrow set of assumptions, it must explain in detail why other assumptions were treated with less weight or ignored. NMFS must also convey the consequences of falsely accepting this narrow set of assumptions in alternative management options.

Two assumptions must be true to support the conclusion that smolt transportation and other BiOp measures have successfully compensated for the mainstem dams and reservoirs: high 'D'-value (i.e., very little difference in post-Bonneville mortality between inriver and transported fish) *and* little to no delayed mortality of inriver and transported smolts associated with their hydrosystem experience (e.g., cumulative stress and strain of collection, sorting, holding, loading, barging and releasing transported smolts; and cumulative stress and strain of delay, bioenergetic demand, disorientation, pressure changes, dissolved gas, etc. of passing through eight dams and reservoirs for in-river migrants). The BiOp and Recovery Strategy do not discuss the likelihood of both these points being true, within the context of the evidence described above. In other documents, NMFS has identified numerous aspects of the current migration experience that can cause stress (NMFS 2000a).

The BiOp and Recovery Strategy should also describe the management implications if 'D' is not high *or* "extra" mortality is hydrosystem related, and the management implications if 'D' and "extra" mortality are moderate. These assessments are critical to an objective risk analysis.

While NMFS may disagree with the relative magnitude of mortality our analysis supports allocating to the hydrosystem, NMFS' must explain why it dismissed delayed (i.e., "extra") hydrosystem mortality associated with inriver smolt migrants when evaluating the jeopardy standard. To view this issue as basically an "all or none" effect is inconsistent with formal decision analysis methods for addressing uncertainty (e.g, Marmorek et al. 1998). Allocations that recognize the arguments for additional hydrosystem mortality (for inriver and transported fish), would alter the outcomes of the RPA analysis significantly (e.g., BiOp Table 9.2-3).

Comparing spawner-recruit patterns between similarly behaving upriver and downriver stocks is one of several analyses to help determine remaining discretionary mortality associated with the FCRPS versus other sources of mortality, such as ocean conditions and estuary predators. This key analysis and important component of the PATH analyses (e.g., Marmorek et al. 1996; Marmorek and Peters 1998; SRP 1998) has been largely ignored in the CRI analyses and BiOp and Recovery Strategy; yet, it is an important analysis in helping tease out the full expression of direct and delayed mortality associated with the hydrosystem. These comparisons are critical in helping determine whether recovery actions have compensated for the effects of the dams.

Prior to completion of the lower Snake River hydrosystem, Snake River stocks of spring/summer chinook generally performed as well or better than similar stocks originating below the four lower Snake River dams. Since completion of the lower Snake River hydrosystem, Snake River stocks perform much worse than their downriver counterparts (Marmorek et al. 1996; Schaller et al. 1999), except during years when smolts migrated with high natural flow and spill (Figures 1 and 3).

These indicator stocks from upriver and downriver locations have similar life-history strategies. They migrate at similar times, ages and sizes; are exposed to similar estuary conditions and predators; there is no compelling evidence they go to different areas of the ocean (particularly during early ocean residence when relative year-class strength is often determined), or that a selective change in ocean distribution of fish coincided with completion of the lower Snake River hydrosystem. The primary difference between upriver and downriver indicator stocks is their location above or below the four lower Snake River dams.

PATH analyses show a strong "common-year-effect" among upriver and downriver stocks (Deriso et al. 1996). This effect means that both upriver and downriver stocks fluctuate in relative synchrony under good and bad ocean and climate conditions. When oceanographic data indicate poor marine conditions, both upriver and downriver stocks generally respond negatively; when ocean conditions are favorable the common response is positive. So when ocean conditions are poor, both upriver and downriver stocks tend to be depressed, but the gap between the upriver and downriver stocks does not change appreciably. If downriver stocks inhabit "better" areas of the ocean than upriver stocks, this common response to changing ocean conditions would not be evident.

Interior climate conditions also affect the relative upriver/downriver stock comparisons, but with an interesting twist. Snake River spring/summer chinook stocks generally respond favorably to good water years (i.e., high runoff conditions) during smolt migration, but the response is generally higher for upriver stocks than downriver stocks (Figures 1, 2 and 3; Deriso et al. 1996). Thus, in good water years, the disparity between upriver and downriver stocks tends to narrow, supporting the hypothesis that poor migration conditions caused by the additional mainstem FCRPS dams is the primary cause of reduced productivity of upriver stocks relative to their downriver counterparts.

Survival to adult of Snake River spring/summer chinook has been consistently less than that of down-river populations since completion of the hydropower system, even with transportation. PATH analysis indicates that Snake River stocks have returned adults to the Columbia River mouth only about 1/3 as well as similar stocks originating above 1-3 dams (μ = 1.15 and $e^{-\mu}$ = 0.32; Deriso et al. 1996). Since the mid-1980s, the relative performance of Snake River stocks has been even poorer (Figure 7), at less than one-fifth the relative survival of down-river stocks. The hydropower system also reduces survival rates of returning Snake River adults to a greater extent than down-river adults, which is not represented in Figure 7.

Similarly, smolt-to-adult survival (SAR) of Snake River spring/summer chinook transported during 1989-1995 averaged 0.29% compared to 2.17% for Yakima River spring chinook (Figure 8). The Yakima River is located above the four lower Columbia River dams. Except for 1992 and 1993, Yakima River SARs ranged from 2% to 4%. In these years when Yakima River SARs declined to 0.5%, Snake River SARs dropped to 0.05%, an order of magnitude lower. The Yakima/Snake analysis includes adult migration impacts associated with the hydrosystem and incorporates adult returns through 1998.

NMFS (November 1999) responded to IDFG comments (IDFG 1999) that there were two reasons for not emphasizing the upstream/downstream stock comparisons in their draft A-Fish Appendix (*See* Appendix B). First, NMFS said the results were not as clear-cut as IDFG implied, because there were other changes to the ecosystem at the same time. The second reason was that NMFS rejects the experimental design because there are no controls.[33]

NMFS responded that upstream and downstream stocks were placed in different ESUs and would be expected to respond differently to changing environmental conditions (Appendix B). However, the technical document used as a basis for the designation (Matthews and Waples 1991) shows that these upstream and downstream stocks are closely related and from common lineage. Figure 5 of Matthews and Waples (1991) shows that the estimated genetic distance between these groupings is very small. These concerns by NMFS did not receive strong support in the PATH weight of evidence process (SRP 1998).

NMFS also states that a difference might be expected between upstream and downstream stocks because of different age composition of spawners (presumably a bad ocean would be especially bad on longer-lived stocks). Aside from lack of evidence, there are two flaws in this reasoning. First, year class strength appears to be set in the estuary and early ocean stages (where the two stock groupings closely overlap in time and space), not in the later ocean life-stages. Second, the adult age composition of the Minam River spring chinook is very similar to that of lower river stocks, yet the Minam's decline was like that of other Snake River stocks. NMFS should explain this discrepancy in its analysis.

[33] A constraint, oddly enough, that NMFS fails to uniformly apply to their favored hypotheses.

The final point in NMFS' response is also flawed. NMFS cited a now-published manuscript (Zabel and Williams 2000) to argue that upper Columbia River spring chinook declines began a generation after the dams were completed in that part of the basin. IDFG (Appendix B) and Schaller et al. (2000) point out that Zabel and Williams used the wrong metric to make their argument because they plotted ln(recruits/spawner) to make their argument of a lag in population response to dam construction. Zabel and Williams ignored the concept of density-dependence in stock-recruitment assessment. Recruits per spawner would be expected to increase as spawner numbers decrease from this factor alone. A more-valid comparison would have been to use the deviations from the stock-recruitment relationship (i.e., SRI indices in Schaller et al. 1999). Examination of the patterns of deviations does not support NMFS' hypothesized lag in response very well (Figure 5 in Schaller et al. 1999). Noise in the data prohibits a precise determination of the first year of decline for the upper Columbia stocks. According to the consensus conclusions of PATH FY96 (Marmorek et al. 1996; conclusion 3a.1):

> We are highly confident that the differences in stream-type chinook indicators of productivity and survival rates between upstream (Snake River sub-basins) and downstream stocks (lower Columbia sub-basins) are coincident in space and time with development of the hydrosystem.
>
> We are reasonably confident that on a decadal scale, the differences in stream-type chinook indicators of productivity and survival rates between upstream (Upper Columbia sub-basins; i.e., Methow, Entiat, and Wenatchee) and downstream stocks (lower Columbia sub-basins) are coincident in space and time with development of the hydrosystem.
>
> We have low confidence that on a finer time scale, changes in productivity and survival rates of upper Columbia stocks (Methow, Entiat, and Wenatchee) are coincident with an increase in the total number of dams through which these fish migrate.

The upriver and downriver stock comparisons provide a useful tool to assess remaining hydrosystem effects, relative to changes in the ocean and estuary. Based solely on smolt-to-adult survival pre- and post-completion of the FCRPS, survival of Snake River populations has declined over 80% since the 1960s (Figure 4). Attributing this entire impact to completion and operation of the lower Snake River FCRPS fails to recognize other factors in the fishes' ecosystem that also changed during this period. For example, estuary piscivores were not very evident in the Columbia River estuary until the mid 1980s, when avian and pinniped predator populations began increasing dramatically. Currently the estuary is home to the largest nesting population of Caspian Terns in North America. Near-shore and off-shore ocean conditions, evidenced by higher water temperature and reduced upwelling, also have been generally poorer coincident with completion of the FCRPS. Thus, just examining fish survival pre and post dams does not distinguish the effects of dams from these other important factors.

The upriver and downriver stock comparisons help tease out these different effects and thus provide a better estimate of discretionary mortality. Both upriver and downriver stocks have experienced an average 50% decline in productivity since completion of the lower Snake

River hydrosystem. The fact that this effect is common to both upriver and downriver stocks indicates this mortality is not likely related to the lower Snake River hydrosystem. Removing this mortality would potentially double the survival of upriver and downriver stocks.

Regrettably, much of this mortality common to both upriver and downriver stocks may not be discretionary, resulting from a significant shift in ocean conditions that occurred shortly after the FCRPS was completed. This shift resulted in generally warmer ocean temperature and less upwelling of nutrients and forage. Corroborating scientific information includes: oceanographic data documenting changes in the marine environment; recent population declines in many unregulated rivers throughout the Northwest; and a shift in spatial distribution of some predatory marine fishes. Although global warming may influence changing ocean conditions, we do not classify this additional mortality as manageable at this time.

Although the majority of the additional mortality common to upriver and downriver stocks is likely due to changing ocean conditions, a sizeable portion of this additional common mortality is likely due to discretionary (i.e., manageable) factors. These include avian and pinniped predation in the lower river and estuary, completion and operation of John Day Dam and possible habitat degradation in the estuary. Recent analyses of avian predation indicate Caspian Terns in the estuary may account for one fourth to one fifth of this common mortality (approximately 10-15% mortality) (Collis et al. 1999). We do not know the mortality contribution of other manageable factors, such as pinniped predation, John Day Dam passage and estuary habitat, but expect it is less than effects of poor ocean conditions, as evidenced by relatively good adult returns to downriver indicator streams associated with improved ocean conditions in 1997 and 1998.

The upriver/downriver stock comparisons also indicate a relatively large amount of mortality that is not common to both groups. In addition to the 50% average decline in productivity experienced by both upriver and downriver stocks, productivity of upriver stocks has declined an additional average 67% more than downriver stocks since completion of the mainstem hydrosystem. Removing the mortality unique to upriver stocks would potentially triple the productivity of upriver stocks.

The additional decline in productivity of upriver stocks relative to downriver stocks indicates this portion of mortality *is not* related to factors common to both groups. Both upriver and downriver stocks have similar life history characteristics typical of stream-type chinook salmon; share lower river, estuary and ocean predators and conditions; have similar disease histories, prevalence and exposure (other than related to barging); similar hatchery influences (other than related to barging); common ancestral lineage; similar or better tributary habitat conditions for upriver stocks; and similar survival in spawning and rearing areas.

The additional decline in productivity of upriver stocks relative to downriver stocks indicates this portion of mortality *is* related to factors unique to upriver stocks. The primary factors unique to upriver stocks are the completion and operation of four additional mainstem dams and reservoirs, and extensive smolt collection and transportation. We are unaware of any other significant factors that are unique to the upriver stocks and coincident in time and space with fish declines.[34] Our analysis of the magnitude and pattern of the decline of upriver stocks relative to downriver stocks indicates hydrosystem-related mortality is still a major source of anthropogenic mortality in the lifecycle of Snake River spring/summer chinook salmon. As described earlier in this section, other scientific information corroborates substantial delayed or "extra" hydrosystem mortality, including: smolt transport effectiveness relative to uncollected inriver migrants; contrasting inriver and smolt-to-adult survival patterns based on route of dam passage; contrasting transport survival based on smolt collection site; bioenergetic demands on inriver smolts; magnitude of change from historical migration conditions (both inriver conditions and collection and barging conditions); and greatly reduced life-cycle survival of all species and races of Snake River anadromous fish.

Of the average five-fold decline in productivity evident for Snake River indicator stocks since completion of the mainstem hydrosystem, approximately two-fold can be attributed to discretionary and non-discretionary factors common to both upriver and downriver stocks (e.g., ocean conditions, estuary habitat, estuary and lower river predators, John Day Dam passage), and approximately three-fold can be attributed to primarily discretionary factors unique to upriver stocks (e.g., completion of the mainstem FCRPS).

If smolt transportation and other recovery actions have compensated for the effects of the additional mainstem dams, then the gap between survival of upriver and downriver stocks should have narrowed as improvements were implemented. This has not occurred (Figures 3, 7 and 8). The only years upriver stocks have come close to performing as well as downriver stocks, since completion of the mainstem dams, occurred in the mid-1980s, following good runoff conditions evidenced by high natural flow and uncontrolled spill at mainstem dams (Figures 1 and 3). This pattern is consistent with preliminary survival data for adults returning in 1999 and 2000. Preliminary data indicate improved ocean and inriver (e.g., high natural flow and spill) conditions for these fish are associated with improved survival rates and less disparity between upriver and downriver stocks. This is consistent with what we would expect.

The upriver vs. downriver comparison is critical to long-term recovery decisions because it allows for analysis of the full expression of direct and delayed mortality associated with the lower Snake River hydrosystem and smolt transportation program. Other analyses may only represent a portion of this overall mortality (e.g., reservoir-reach survival studies). The CRI analysis used in the BiOp and Recovery Strategy largely ignored the upriver vs. downriver stock comparisons, particularly in the context of examining the plausibility of non-hydro related "extra" mortality, assessment of discretionary mortality and identification of conservation opportunities.

Given the results of the upriver vs. downriver stock comparisons, the following assumptions must be true in order to conclude that smolt transportation and other recovery efforts have compensated for the lower Snake River dams. First, it must be assumed there is little or no delayed mortality associated with smolt collection and transportation or smolt

[34] Some of this coincident effect could be explained if upriver spring/summer chinook indicator stocks go to worse areas of the ocean during their critical first year compared to distribution into better areas of the ocean by similar downriver spring chinook indicator stocks; but the plausibility of this hypothesis is weak, based on available data. This hypothesis is discussed in more detail in the section on delayed mortality in Step 4.

migration through the dams and reservoirs. Second, because the overall trend in adult returns is still downward, you have to assume mortality is occurring below Bonneville Dam (i.e., estuary and ocean). Third, because adults from downriver stocks are returning at higher rates, you have to assume this additional cause of mortality in the estuary and ocean is selective for upriver stocks but is not related to delayed effects of the dams or smolt collection and transportation. And fourth, because upriver stocks performed as well or better than downriver stocks prior to completion of the lower Snake River dams, you have to assume this cause of selective mortality appeared on the scene about the same time the dams were completed, but is unrelated to the dams.

NMFS must explain why the PATH Retrospective, WOE and SRP reports, which addressed these assumptions and found them lacking, were largely ignored in the CRI and All-H allocation of mortality.

Step 5: Assess management opportunities to address this discretionary mortality.

If the 2000 BiOp and Recovery Strategy correct the errors and omissions outlined in steps 1 through 4, the documents will focus management actions on addressing the direct and delayed effects of the mainstem FCRPS, complemented with appropriate actions addressing freshwater and estuary habitat, predators, harvest and hatcheries.

The BiOp and Recovery Strategy represent a fundamental shift to a diminished role of the mainstem hydrosystem and heightened role of habitat, hatcheries and flow augmentation. Conservation opportunities in the other Hs cannot make up for impacts of the mainstem hydrosystem. This is not to say that tributary and estuary habitat improvement, predator control, selective fisheries and conservation hatcheries are not important. In fact, their importance increases the closer our fish get to extinction. But the conservation burden of these sectors must be kept in perspective.

NMFS' estimates of expected improvement from FCRPS actions in the RPA accentuate our concern that the BiOp has shifted too much of the hydrosystem conservation burden to other sectors. The BiOp concludes current FCRPS operations constitute jeopardy, and then identifies a RPA to avoid jeopardy. The RPA measures associated with juvenile spring/summer chinook migration through the hydrosystem are only expected to improve survival by 1-2% over current operations (2000 BiOp, pages 6-76 and 9-161, Tables 6.3-2 and 9.7-6). Expected benefits in adult migration, habitat and hatcheries are used in the BiOp to avoid jeopardy, but the biological feasibility of these benefits is not quantified.

The BiOp fails to explain why little effort is concentrated on improving survival associated with juvenile migration, despite the overwhelming support of the scientific community for such action.[35] The BiOP places high hopes on improvements in adult migration,

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[35] The Salmon Managers are the state, tribal and federal entities with statutory authority and responsibility for managing salmon and steelhead in the Columbia River Basin. These include Idaho Department of Fish and Game, Oregon Department of Fish and Wildlife, Washington Department of Fish and Wildlife; Shoshone-Bannock, Nez Perce, Yakama, Warm Springs, and Umatilla tribes, United States Fish and Wildlife Service and National Marine Fisheries Service. Resolutions by the Pacific States Marine Fisheries Commission, Pacific Fisheries Management

habitat and hatcheries, whereas available data indicates these benefits are unlikely to be biologically feasible (Appendix A; Marmorek et al. 1996, 1998), and NMFS has not assessed feasibility (Appendix A). Other salmon managers in the Basin are in agreement that these areas of discretionary mortality are less significant than hydrosystem impacts on juveniles, and are unlikely to provide survival improvements sufficient for recovery (IDFG 1998; ODFW 2000; STUFA 2000).

The federal approach is unlikely to secure the survival and recovery of Snake River salmon and steelhead. The BiOp and Recovery Strategy overestimate, or in some measures does not estimate, survival improvements currently attributable to existing management actions and those expected from the Reasonable and Prudent Alternatives (RPA) of the 2000 BiOp.

- NMFS makes the optimistic assumption that any improvements in survival since the 1995 BiOp are a result of BiOp measures, rather than including improvements from higher natural flows.

- NMFS makes an assumption that the RPA will reduce FCRPS mortality of adults by 25% (which is estimated to improve survival by 7%), although no data or analyses are provided to support this claim.

- NMFS selects optimistic assumptions (e.g., minimal delayed mortality) regarding the level of impact attributable to the FCRPS, reducing the hydrosystem burden for conservation and recovery.

- NMFS shifts the conservation burden to habitat, harvest and hatcheries without a biological justification for this shift, or an equitable assessment of appropriate conservation burdens. NMFS makes this shift based on hypothetical "numeric experiments" that focus on total mortality in each life stage, rather than the discretionary mortality above the natural baseline.

- NMFS also failed to assess the biological feasibility of these actions, the feasibility of implementing these actions quickly, and the feasibility of near-term survival improvements once the actions are implemented. For example, the BiOp and Recovery Strategy present an ambiguous message regarding spawning and rearing habitat in the Snake River basin. On one hand, NMFS shifts a primary focus for recovery to freshwater spawning and rearing habitat (BiOp pgs. 9-12, 9-13), but on the other hand assigns Snake River watersheds a lower priority for habitat measures because habitat measures above eight dams offer little potential for improvement (draft Recovery Strategy Vol. 2 p. 13). The documents also fail to identify specific measures for implementation and a rational basis for assigning expected benefits.

Because NMFS inappropriately shifts the conservation burden away from the FCRPS, the BiOp RPA for hydrosystem actions does not significantly change from current operations. The

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Council, Idaho and Oregon chapters of the American Fisheries Society and the Western Division of the American Fisheries Society all identify the FCRPS as the primary factor limiting recovery of listed Snake River salmon and steelhead.

RPA basically has the same spill, flow and transportation actions identified in the 1995 and 1998 FCRPS BiOps. There were numerous times during the past five years that even these provisions were not met (e.g., see TMT minutes and SOR disposition; FPC 2000).

Step 6: Select a suite of management actions that are likely to provide the necessary survival improvements.

Selection of management actions to address discretionary mortality is a policy decision based on biological and non-biological factors. However, these actions must be based on sound science and address enough of the primary sources of mortality to meet survival and recovery standards. The BiOp and Recovery Strategy fail to identify specific management actions or thoroughly assess the expected contribution of these actions toward necessary survival improvements.

The BiOp concludes that a 30-60% increase in survival estimated from FCRPS improvements of the RPA result in no-jeopardy to Snake River salmon and steelhead (Appendix A, Tables 1, 2 and 3; BiOp Tables 9.7-6, 9.7-10, 9.7-12 and pgs. 9-220, 9-221, 9-222), even though not all stocks meet the standard without additional survival improvements.[36] It is not surprising that the CRI analysis indicates some stocks meet the standards because of the numerous optimistic assumptions incorporated into the analysis (Table 1). These necessary survival improvements are underestimated by NMFS, as discussed above in Step 1. In contrast, PATH estimated recovery would require approximately a 170% increase in survival rates for Snake River spring/summer chinook (Peters and Marmorek 2000).

NMFS' own assumptions and analyses demonstrate the difficulty in providing substantial survival improvements with the RPA relative to the natural river option for Snake River salmon and steelhead (Tables 1, 2 and 3 in Appendix A). This is particularly noteworthy given the lack of evidence to support the assumption of little or no delayed mortality associated with the hydrosystem experience, and the weight of scientific evidence to the contrary. Our analyses indicate it is highly unlikely for non-breach alternatives alone to provide the necessary survival improvements required for survival and recovery of Snake River salmon and steelhead. Given the current BiOp approach, it is important to implement an aggressive suite of alternative management actions across the lifecycle of the fish, but focused on the mainstem FCRPS. In other words, the draft RPA must be strengthened. This is important to protect and enhance salmon and steelhead as much as possible under the proposed RPA.

NMFS should consider the Governors' Recommendations,[37] which do a better job of keeping the primary sources of discretionary mortality in focus and embracing a conceptual approach to attempt to address these problems. Through their annual migration plans and involvement in the Regional Forum, NPPC program, and Governors Recommendations, IDFG

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[36] Some new CRI results were posted on their web page September 12, 2000, which are even more optimistic regarding the ability of the RPA to meet jeopardy standards. Once again, this was a non-collaborative effort, we were not notified of this specific development, and we have not had time to thoroughly review the analysis or conclusions. See the Recent Developments section of this document for our preliminary review of this new analysis.

[37] *Recommendations of the Governors of Idaho, Montana, Oregon and Washington for the Protection and Restoration of Fish in the Columbia River Basin*. July, 2000.

and the State of Idaho have identified several actions that would more aggressively address significant sources of direct and delayed discretionary mortality than the existing RPA. IDFG and the State of Idaho will provide specific recommendations for enhancing the RPA during subsequent comments and consultation with NMFS and the Federal Caucus.

These measures to refocus and enhance the RPA will help moderate extinction risk, increase the frequency of rebuilding opportunities and increase the frequency of harvestable hatchery surpluses compared to the existing RPA, although they are unlikely to provide the magnitude of survival benefits required to secure recovery. If environmental conditions (e.g., annual snowpack, ocean temperature, coastal upwelling) deteriorate during this interim period, then more aggressive actions than those described above should be immediately considered, including the natural river option.

Step 7: Develop an aggressive monitoring and evaluation plan to assess effectiveness within the context of environmental variability.

The BiOp and Recovery Strategy do not identify an adequate monitoring and evaluation program to assess the effectiveness of management actions within five, eight and ten years. It is not scientifically feasible to implement new actions, particularly focused on habitat improvement, and expect to evaluate the effect of these actions on population growth rates within one decade. Thus, many of the performance standards and measures in the 2000 BiOp and Recovery Strategy are relatively meaningless in the context of the breach decision.

Instead, the primary factors that will likely determine whether or not population growth rates are adequate during the next few years are the weather and ocean conditions. If snowpack and ocean conditions are favorable during the evaluation period, population growth rates may meet the standard. If these environmental conditions deteriorate, then it is unlikely population growth rates will meet the standard. Thus, it is very important that performance standards and measures capture the relative influence of these environmental variables (e.g., see Figures 1 and 2).

IDFG is concerned that the BiOp and Recovery Strategy represents a fundamental shift away from an emphasis on recovery to an emphasis on simply avoiding extinction. Recovery standards and performance measures must all point toward the goal of sustainable and naturally diverse fish runs with inherent productivities adequate to meet the biological needs of the fish and provide societal benefits. These performance standards and measures should be developed collaboratively with state and tribal fishery, water and land managers.

Performance measures are the means of tracking progress toward recovery standards, and should be nested within a hierarchy to ensure a clear delineation toward recovery. For example, the *Primary* measure of success should be based on adult returns and overall life cycle survival (adult-to-adult) for naturally spawning indicator populations representing the diverse stock structure of the Snake River basin; *Secondary* measurements of success should include relative survival among upriver and downriver indicator stocks, smolt-to-adult survival, and egg-to-smolt survival; *Tertiary* measurements could include partitioning survival more finely within life stages (e.g., survival through the migration corridor) and achieving a desired condition for key ecosystem attributes, such as water quality, quantity and velocity, riparian health, predatory impacts, fish health and condition, etc. It is important that this hierarchical context remains clear, so that tertiary or secondary measurements do not become an "end unto themselves" but rather a means to our primary measures of success.

VI. Recent Developments

NMFS released new results for the BiOp in September 2000, nearly 1-1/2 months into the 2-month comment period. IDFG was notified of the release of the new analysis and updated BiOp Appendices B and C on September 5, 2000 (Toole 2000), which NMFS posted on their websites. However, IDFG was not notified of the updated BiOp tables released September 12, 2000. The new results were substantially more optimistic for current operations and the RPA than those in the BiOp. For example, Revised Table 9.2-3 now indicates that of Snake River spring/summer chinook index stocks, only the Imnaha stock would not meet recovery for RPA actions under NMFS' optimistic assumptions. The cover page for these updated results states: " The new CRI analysis reduces NMFS' concerns regarding inclusion of the upper bound of estimates in defining the offsite mitigation standard (Section 9.2.2.2.2, page 9-13)."

IDFG concerns regarding the optimistic analyses produced by NMFS for the July 12, BiOp (discussed above) have been heightened since the September 12, 2000 release of the new CRI analysis. We are concerned about the continually changing methodologies and shortcomings of the key standard (λ) used to evaluate population status. The latest CRI calculations of λ (and consequently recruits/spawner) are highly optimistic compared to the empirical information (and values produced by the CRI Leslie matrix models). As a result, the probabilities of extinction and recovery for status quo and RPA options are made even more optimistic, and the required survival improvements are minimized by errors in the new analysis.

The updated λ estimates appear to overestimate the actual stock performance by about 20% (range 0% to 60%), in terms of spawning ground recruits per spawner (R_{sg}/S). Empirical estimates (geometric mean) of R_{sg}/S for Snake River spring/summer chinook index stocks range from 0.41 to 1.19 for brood years 1980-1994 (Figure 9). The CRI Leslie matrix modeling approach generates identical estimates of R_{sg}/S (Figure 9), using the information from the NMFS' spreadsheets (*_sept7Update.xls, from hydro2000b.zip). From the Leslie matrices, $R_{sg}/S = (\lambda)^{\text{generation time}}$ where generation time is approximately 4.5 years. However, the new CRI analysis produces R_{sg}/S estimates that are much greater than the empirical values for several stocks (Figure 9). It follows that if λ and R_{sg}/S are overestimated, then risks to the populations are underestimated and survival improvements to avoid jeopardy are also underestimated.

The latest problem appears to stem from a new methodology used for the September 12, 2000 estimates, which uses a one-year lag to estimate λ from the spawner time-series. The new methodology essentially takes a weighted running sum of spawners from 1981-1985 and divides that by the weighted sum of spawners in 1980-1984, and repeats the approach through the full time series. There is no apparent biological reason for the CRI focus on a one-year lag. The lag of one year is not consistent with age structure of these populations. We know from the data that spawners in 1980 produced recruits primarily in 1984 and 1985, a few recruits in 1983, but none in 1981 and 1982. It appears that a lag of between 4 and 5 years would be more biologically defensible. For example, Marsh Creek spring chinook R_{sg}/S estimate was 0.6 (geometric mean) for 1980-1994 brood years, and identical to the CRI Leslie matrix estimate (Figure 10). However, using the running sum method for a one-year lag, the estimated R_{sg}/S equals 0.94 (Figure 10). The running sum method also appears to overestimate R_{sg}/S for the longer lags for the Marsh Creek stock (Figure 10).

It is also unclear from the CRI documentation exactly how the CRI running sum method can be used to account for operations at hatchery weirs, such as in the Imnaha River where natural origin recruits are removed for the broodstock program. The method appears to use only spawner numbers: either natural origin spawners or total (natural plus hatchery) spawners. This may work in a case where hatchery spawners simply stray into the area, but where natural origin recruits are removed at a weir, neither natural spawners or total spawners cleanly account for this subtraction. The run reconstruction methods used to generate the R_{sg}/S data explicitly do this accounting. It is unclear why the empirical estimates of R_{sg}/S, or Leslie matrix estimates of λ and R_{sg}/S were not used to evaluate risk to the populations, given this problem and the overestimates of stock performance generated by the running sum method.

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